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CONTENTS

OCTOBER/NOVEMBER 1985

commodore power/play

DEPARTMENTS

COMPUTER WIZARD

All about Programmable Function Keys by Louis F. Sander 6

NEWS FROM THE FRONT 12

ADVENTURE ROAD

Put an Orc in Your Party by Shay Addams 18

GAME REVIEWS

Impossible Mission reviewed by Tracie Forman Hines 20
Mindshadow reviewed by Tom Benford 22
Breakthrough in the Ardennes reviewed by Rick Teverbaugh 24
Felony! reviewed by Cheryl Peterson 26
Word Finder reviewed by Cheryl Peterson 28
Broadsides reviewed by Jeffrey Seiken 30
Web Dimension reviewed by Bob Sodaro 33
Crusade in Europe reviewed by Gary Fields 52
Business Games reviewed by Christine Adamec 54
Mail Order Monsters reviewed by Mark Cotone 58
50-Mission Crush reviewed by Cheryl Peterson 60
Panzers East reviewed by Jeffrey Seiken 62
Rainy Day Fun reviewed by Tom Benford 64

SOFTWARE REVIEWS

Music Video Kit reviewed by Jaime Wilcutts 88
The Music Studio reviewed by Ted Salamone 89
Many Ways to Say I Love You reviewed by Tom Benford 90

JIFFIES

128 Circles by Jerry A. Sturdivant 91
Commodore Crossword Puzzle by Bruce Jaeger 92
How Your Printer Works by Louis Wallace 93
Scarey Halloween for the 128 by Bruce Jaeger 95

GAME PROGRAMS

Dogfight by Roger Macomber 99
Jungle Heat by Mark Jordan 102

COMPUTER TUTOR

Game Design: Part 1, Custom Characters by Robert Alonso 105
Muti-Color Bar Graphs by Roger Macomber 109

THE COMPUTER SCIENTIST

Artificial Intelligence and the Game of Matcher by Isaac Malitz 112

FEATURES

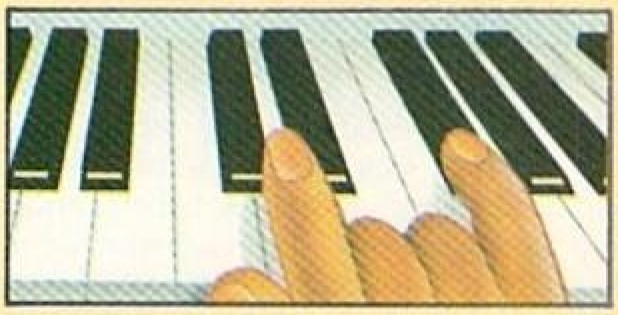
WHAM
BRAT
BRAT

MODERN WAR ON THE 64 66

War games played on the 64 are a different breed from the old board games. They give the players time for strategy and creative thinking, instead of bogging them down in calculations and rules. by Arnie Katz

64 WAYS TO MAKE MUSIC 70

A comprehensive guide to hardware and software music-making on the Commodore 64. by Peggy Herrington



PICTURES OF JAPAN 76

A computer journalist's photographic impressions of our high-tech neighbor across the Pacific. by Dan Gutman

COMPUTER LITERACY TUTORIALS 80

Video and audio tapes and even the computer itself are all being used to teach computing. Here's a selection of tutorials to help you get more out of your Commodore 64. by Tom Benford
With a look at new books about the 64 by Joyce Worley

USER GROUPS 116
HOW TO ENTER PROGRAMS 123
ADVERTISERS' INDEX 128

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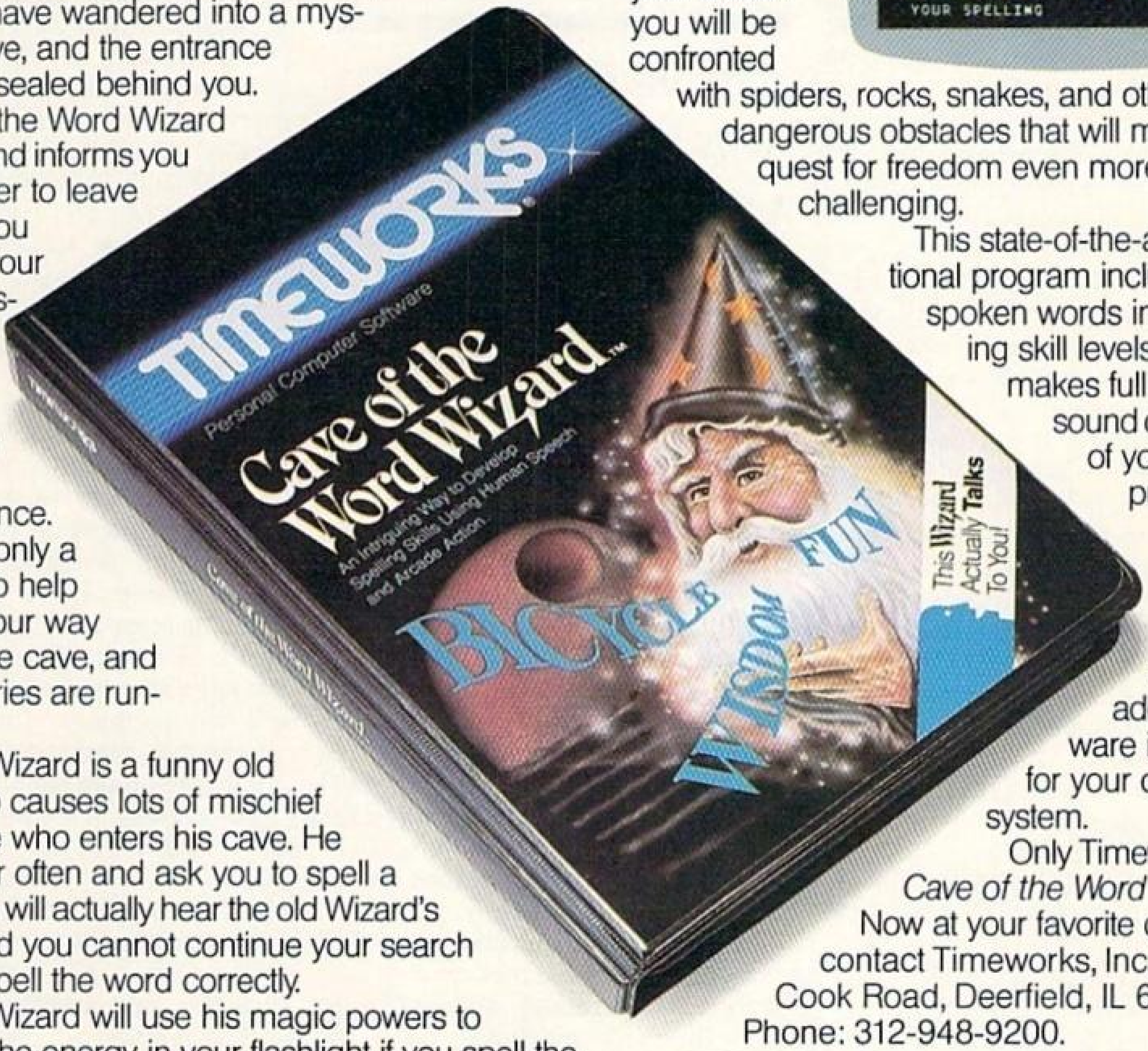
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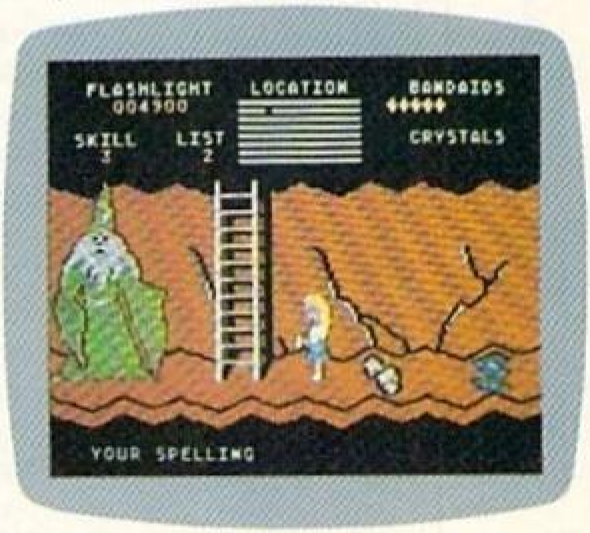
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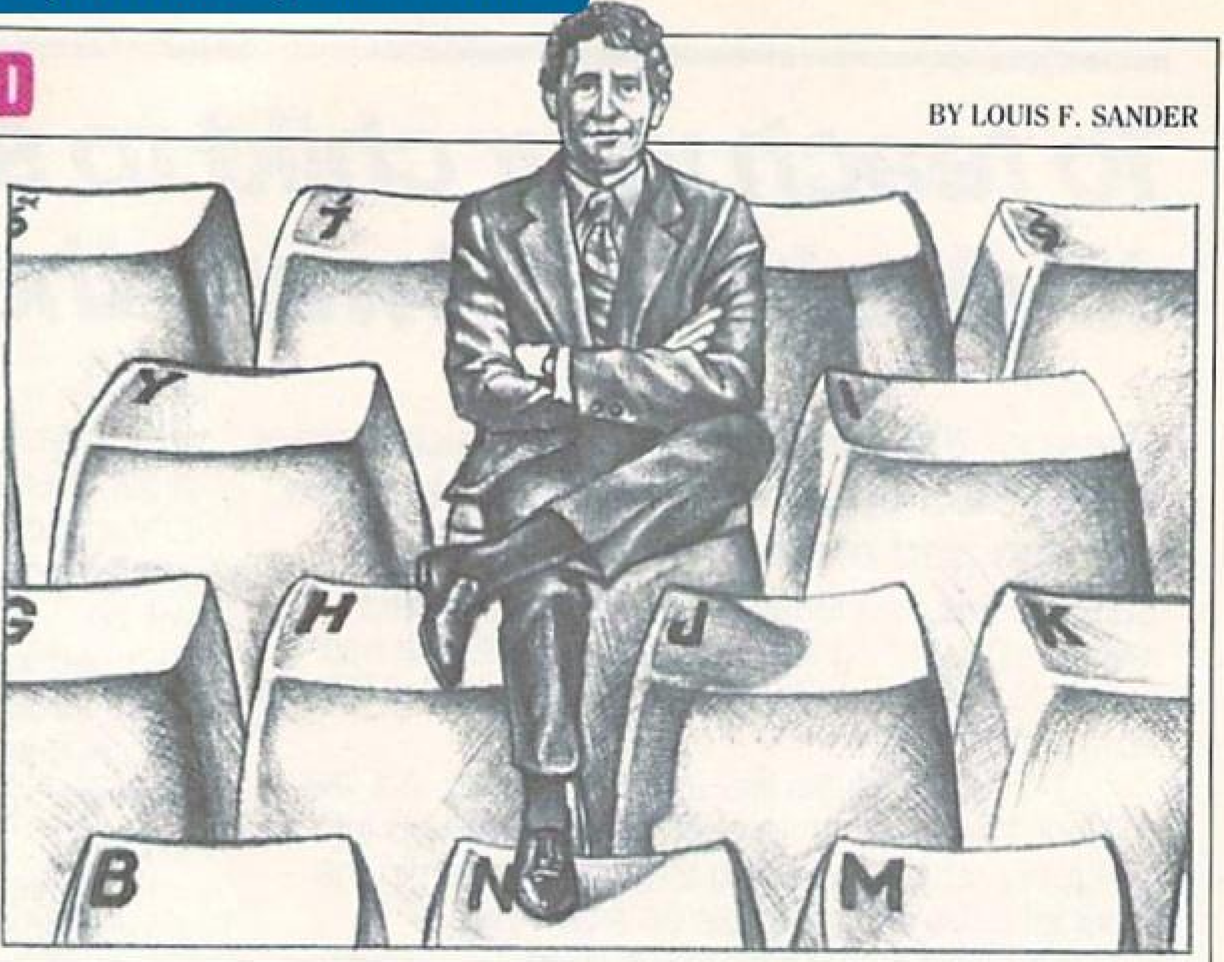
BY LOUIS F. SANDER

All About Programmable Function Keys



In case you haven't noticed, the function keys on Commodore's newer machines are *much* more useful and powerful than those on the Commodore 64. On the 64, the function keys generate single characters in the CHR$(133) to CHR$(140) range. Your program can detect them and branch accordingly. Function keys on the Commodore 128, Plus/4, and Commodore 16 can do that, too, but they can also generate longer streams of characters. If you desire, those character streams can include BASIC keywords which can be printed to the screen and executed. At power up, the function keys are programmed to automate common keyboard activities, such as examining disk directories, and loading and listing programs. If these pre-programmed functions don't suit you, you can redefine them.

This article explores the capabilities of the function keys on all the newer machines. If you have such a machine, we will show you how to work with your function keys. If you aren't yet so lucky, we may give you some reasons to upgrade. From this point onward, we'll assume that you have a 128, a Plus/4 or a Commodore 16, and that you're using it to work our examples.

To see the present definitions of your function keys, just type KEY [RETURN], and something like this will appear on your screen:

```
KEY 1,"GRAPHIC"
KEY 2,"DLOAD"+CHR$(34)
KEY 3,"DIRECTORY"+CHR$(13)
KEY 4,"SCNCLR"+CHR$(13)
KEY 5,"DSAVE"+CHR$(34)
KEY 6,"RUN"+CHR$(13)
KEY 7,"LIST"+CHR$(13)
KEY 8,"MONITOR"+CHR$(13)
```

These are the key definitions at power up for the 128. Those for the Plus/4 and Commodore 16 are identical, except that key 8 is "HELP"+CHR$(13) on both machines, and key 1 is "SYS 1525" on the Plus/4.

Explore the function keys on the Commodore 128, Plus/4, and Commodore 16.

When one of the function keys is pressed, the computer responds as if that key's definition had been typed on the keyboard. In the case of F1 above, the word GRAPHIC is printed, and the cursor remains in the space immediately following. If the key definition includes a CHR$ code, as in key 2 through key 8 above, that code is converted to the appropriate keypress. If it includes quote-mode control characters, the action they represent is taken. For example, if the definition contains a reverse-field heart, the screen will clear when the key is pressed.

The default key definitions shown here make good sense on the Plus/4 and Commodore 16, because they combine related functions on the shifted and unshifted versions of each key. On those machines, F4 is the shifted version of F1. Since the GRAPHIC and SCNCLR commands are closely related, it is logical to put them on the same keybutton. It makes similar sense to combine DLOAD and DSAVE on the F2/F5 keybutton. As you can see, there is method in this scheme, but notice that the keybutton labels are different from the 64's F1/F2, F3/F4, F5/F6, F7/F8 system. (The other Plus/4 keys are F3/F6 and HELP/F7.)

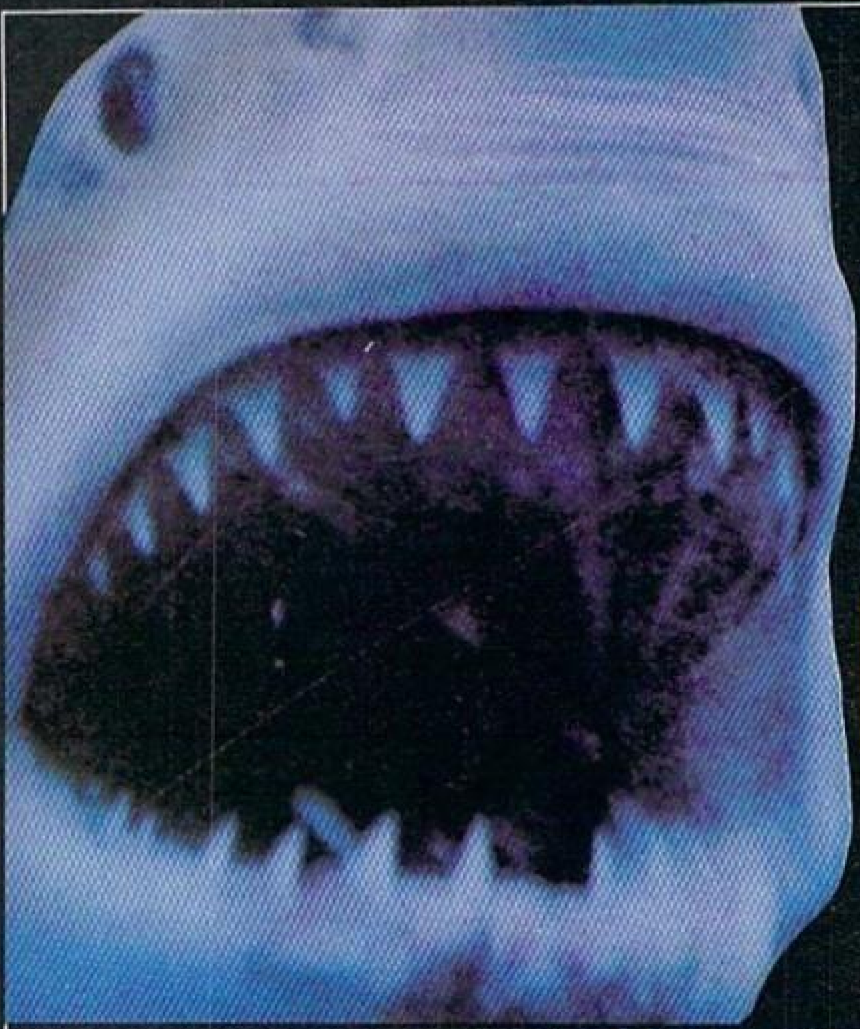
The Commodore 128 was designed to be 100% compatible with the 64, and to be compatible with the Plus/4 and Commodore 16 where possible. That meant labeling the keys in the Commodore 64 pattern, for compatible fingering in 64 mode. In 128 mode, it meant assigning default key values as on the Plus/4, even though the keys are configured differently on the two machines. The result is that on the 128, similar functions are not combined on the same keybutton.

Fortunately, it's easy to re-program the function keys. Want to move DLOAD to the F1 key? Want F7 to clear the screen before listing? Want F4 to direct output to your printer? All these things are easily done! To change a key's definition, just enter:

KEY *n,string*

Continued on pg. 8

Computer Wizard regularly presents elementary topics of interest to Commodore users. It emphasizes the needs of beginners, but is of use to advanced users as well. The column is written to be easily understood by all, and to be of lasting value to its readers. If you have comments or suggestions for Computer Wizard, please write Louis F. Sander, in care of this magazine.



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Valley West Plaza 4185 South 300 West, Suite 12 Ogden, Utah 84403 (801) 392-0109 where *n* is the key number, and *string* is what you want the key to produce when pressed. The contents of *string* can be expressed as characters inside quotes (including the reverse-field characters for cursor controls, etc.) or as CHR$ codes. They can also be expressed as string variables, provided the variables have been previously defined.

Right now, try redefining a key by entering:

KEY 1,"[clr][rvs on] HELLO THERE!"

Then press F1 and see what happens. The screen clears, and HELLO THERE! appears in reverse field, with the cursor blinking immediately thereafter. It is exactly as though the key definition had been typed on the keyboard.

You can let your imagination run wild when redefining keys. The only limitations I've found on my pre-production 128 are that no definition can exceed 127 characters, and that the combined printing of all definitions cannot exceed 241 characters. On the Plus/4 and Commodore 16, the individual and total limits are 128 characters.

Something like +CHR$(255) counts as only one character in those totals, since the plus sign isn't actually printed when the key is pressed, and since CHR$(255) prints as only one character. Exceeding the 127-character limit garbles your key definitions, and attempting to exceed the 128- or 241-character limits causes an out-of-memory error.

The more you know about your character set, the better you'll be able to redefine keys. If you know that CHR$(141) is a shifted RETURN, for example, you'll be able to do something like

KEY 1,"DON'T TOUCH ME!"+CHR$(141)

Try that now, and notice how the shifted RETURN puts the cursor at the start of the next line, without causing a syntax error.

Key 7 in the default definitions shows the use of CHR$(13) to execute a BASIC command. When F7 is pressed, the word LIST is printed on the screen, and a CHR$(13), a RETURN, is immediately executed. Unfortunately, unless your cursor is on a blank line when you press F7, you're likely to get a syntax error instead of a program listing. Try it on a "Don't touch me" line and see.

A little ingenuity can eliminate that problem with ease. List your definitions by entering KEY, then put your cursor on the "L" in key 7's "LIST". Press the INST key to open up a space, then press the CLR key to replace the space with a reverse-field heart. (Don't forget, both of those keys must be shifted to have the desired effect.) Now press RETURN, and whenever you press F7, the screen will clear before the LIST is printed.

Function keys can be redefined from within a program, and the accompanying "F-Key Fixer" program for the three machines provides a useful framework for doing so. Type it in and save it right now, since you'll be using it in a minute or two. Be careful with lines 100-170; each string consists of a number, a space, then seven minus signs. Only six of the eight lines end with semicolons.

Since the program is only a framework, you must modify it before it's really useful. In fact, it won't run error-free until the modifications have been made. But we *can* explain it, at least. Lines 100-170 are designed to hold on-screen reminders of key definitions, while lines 240-310 hold the definitions themselves. The variables

Continued on pg. 10

F-Key Fixer

```
50 REM *** F-KEYS FIXER ***
70 :
80 PRINT CHR$(147):PRINT"FUNCTION KEYS
 :"
90 TA$=CHR$(9)+CHR$(9)+CHR$(9):PRINT
100 PRINT TAB(01)"1 -------";
110 PRINT TAB(11)"3 -------";
120 PRINT TAB(21)"5 -------";
130 PRINT TAB(31)"7 -------"
140 PRINT TAB(01)"2 -------";
150 PRINT TAB(11)"4 -------";
160 PRINT TAB(21)"6 -------";
170 PRINT TAB(31)"8 -------"
180 :
190 DCL$=CHR$(147): REM CLEAR SCREEN
200 QU$=CHR$(34) : REM QUOTES
210 RE$=CHR$(13) : REM RETURN
220 TA$=TA$+":"+RE$: REM DIRECTORY TAB
230 :
240 KEY 1,
250 KEY 3,
260 KEY 5,
270 KEY 7,
280 KEY 2,
290 KEY 4,
300 KEY 6,
310 KEY 8,
```

Better F-Keys

```
50 REM *** BETTER F-KEYS ***
70 :
80 PRINT CHR$(147):PRINT"FUNCTION KEYS
 :"
90 TA$=CHR$(9)+CHR$(9)+CHR$(9):PRINT
100 PRINT TAB(01)"1 DIRECT.";
110 PRINT TAB(11)"3 DLOAD: ";
120 PRINT TAB(21)"5 LIST[SPACE3]";
130 PRINT TAB(31)"7 RUN[SPACE4]"
140 PRINT TAB(01)"2 SCRAT: ";
150 PRINT TAB(11)"4 DSAVE[SPACE2]";
160 PRINT TAB(21)"6 LLIST[SPACE2]";
170 PRINT TAB(31)"8 MONITOR"
180 :
190 DCL$=CHR$(147): REM CLEAR SCREEN
200 QU$=CHR$(34) : REM QUOTES
210 RE$=CHR$(13) : REM RETURN
220 TA$=TA$+":"+RE$: REM DIRECTORY TAB
230 :
240 KEY 1,CL$+"DIRECTORY"+RE$
250 KEY 3,"DLOAD"+TA$
260 KEY 5,CL$+"LIST"+RE$
270 KEY 7,CL$+"RUN"+RE$
280 KEY 2,"SCRA[SHFT T]"+TA$
290 KEY 4,"DSAVE"+QU$
300 KEY 6,"OPEN4,4:CMD4:LIST:PRINT#4
 :CLOSE4"+RE$
310 KEY 8,"MONITOR"+RE$
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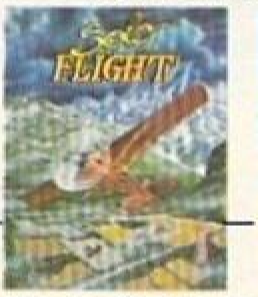
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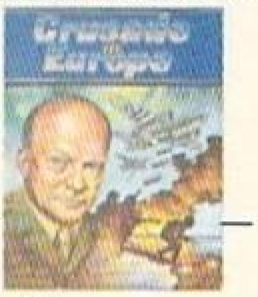
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COMPUTER WIZARD

established in 190-220 help with frequently used control characters.

TA$, defined in lines 90 and 220, tabs the cursor to the "PRG" at the end of a directory entry, prints a colon, then does a RETURN, allowing the directory entry to be used in loading or scratching programs. It won't work with the Plus/4 or Commodore 16, since CHR$(9) is meaningless to BASIC 3.5. If you have one of those machines, you can make your own version of TA$ by using 19 cursor rights in line 90. You can also change the screen message layout to conform to the labeling of your function keys.

Now, by making a modified version of the "F-Key Fixer" program, create the "Better F-Keys" program. As before, be meticulously careful in typing. When an on-screen reminder is shorter than seven characters, be sure to pad it with spaces; the dashes are there to help you with this task. In line 280, the letters in quotes are S-C-R-A/shifted T, which is a legal abbreviation for SCRATCH.

Run the "Better F-Keys" program and observe the helpful screen display. After the program has been run, pressing F1 will display your disk directory. When your cursor is at the start of a directory entry, F3 will automatically load that program. The reprogrammed F5 will list the program, while F7 will run it. F1, F5 and F7 will clear the screen before doing their work, so your cursor needn't be on blank line when you press them. That can prevent many syntax errors.

The other keys are also useful. Put your cursor in the first column of a directory entry, and F2 will scratch that file. (You still must respond to the "Are You Sure?" prompt.) F4 types DSAVE and a quote mark, while F6 lists your program to the printer. As in the power-on key arrangement, F8 calls the built-in machine language monitor.

On the Commodore 128, the advantage of this arrangement is the logical placement of the keys. From left to right, it's easy to remember DIRECTORY, DLOAD, LIST and RUN, because that's the normal sequence of operations. Also, the same keybutton is used to DLOAD and DSAVE, while a different one is used to LIST, either to the screen or to the printer. The two left-most buttons control the disk—unshifted to read it, shifted to write. By exercising your creativity, you can establish a similar pattern on the other machines.

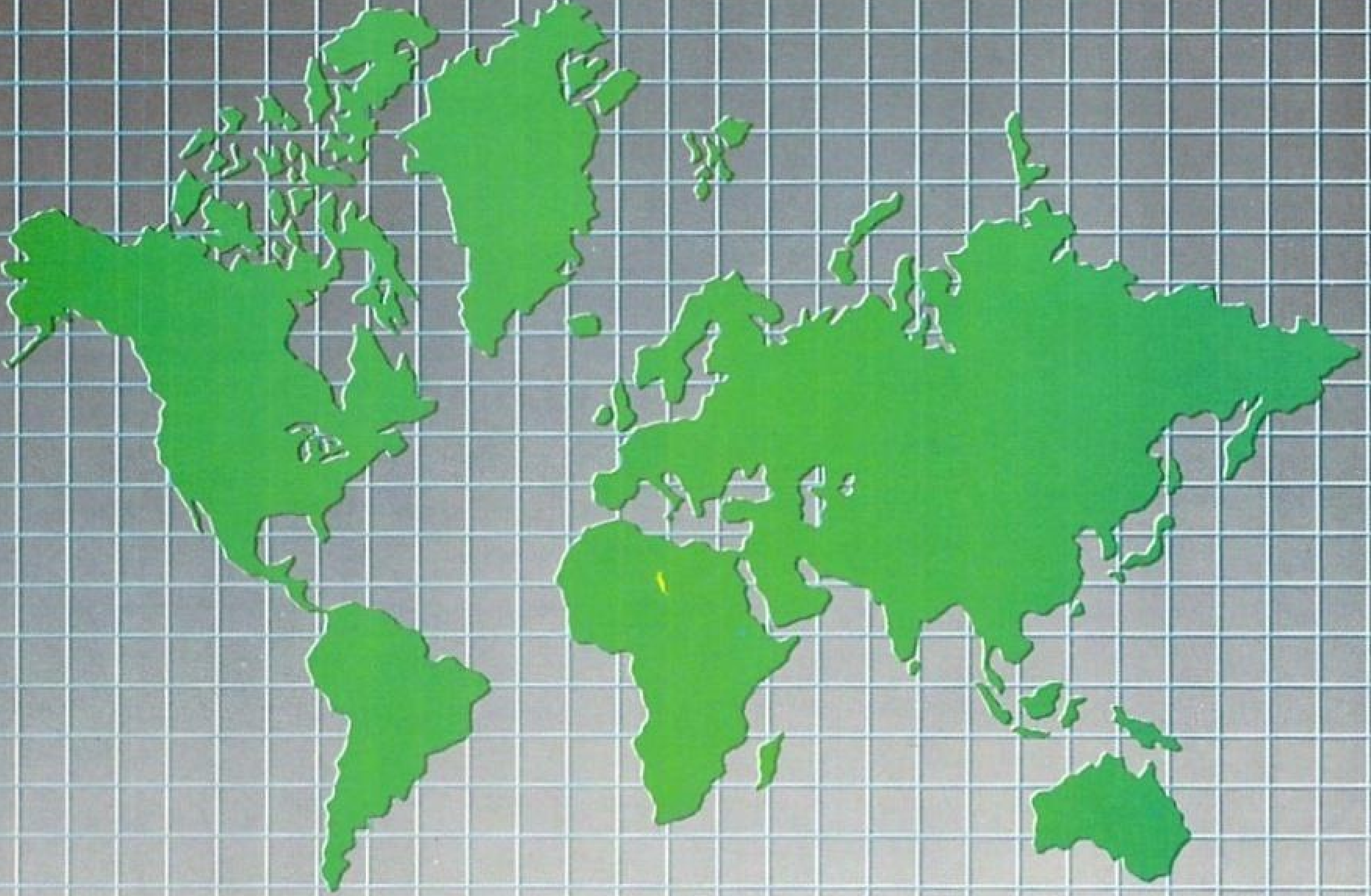
Of course, you can use "F-Key Fixer" to make all sorts of custom configurations. As you work with the function keys, you'll find other ways to set them up for various situations. Once you've found your favorite arrangement, make a customized version of "F-Key Fixer" and save it as the first program on your diskettes. Then you can take advantage of another feature of the 128—the ability to use shifted RUN/STOP to load and run the first program on the *disk* (rather than the tape, as in previous Commodore computers). When you need to redefine your function keys, hit shifted RUN/STOP, and the job will be done automatically.

Well, dear reader, if you've stuck with us this far, you're an expert in programmable function keys. Here are some suggestions to use in your further work:

- Escape key sequences have interesting effects, which might be useful on function keys. Simulate the escape key by using CHR$(27).
- You can abbreviate the BASIC keywords in function key definitions. L-shifted-I will do the same thing as LIST, even though it prints out differently on the screen.
- If you don't want to see your function key definitions as the key is pressed, include color key characters to switch them to the screen color and back.
- When you work with "F-Key Fixer," all keys must get a definition, even if it's only a null string.
- Use these statements to give the function keys the same meanings they had on the Commodore 64:

  ```
  FOR J=0 TO 3 : KEY
  1+2*J,CHR$(133+J) : NEXT :
  FOR K=1 TO 4 : KEY
  2*K,CHR$(136+K) : NEXT
  ```
- Use KEY after running "Better F-Keys," and notice that the CHR$(9)'s show up as reverse-field I's. This sort of conversion is common when working with function keys. ◼

SCENERY DISKS *for* FLIGHT SIMULATOR II



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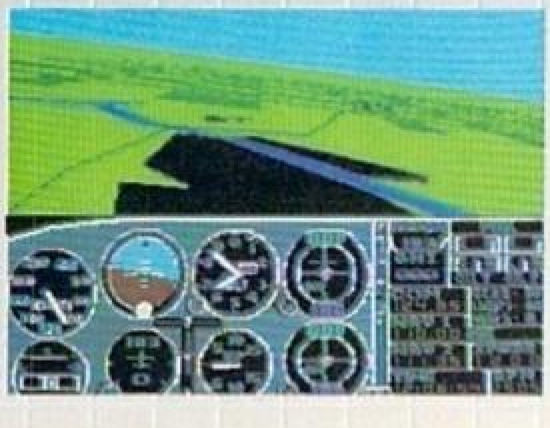
A STAR Scenery Disk (available 4th quarter 1985) covers a smaller area with a relatively dense amount of scenery. STAR Scenery Disks are primarily intended for visual flight sight-seeing. They include buildings and landmarks, as well as detailed renditions of all major airports in the area.



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POWER PLAY'S NEWS FROM THE FRONT

Young Astronaut Program Hosts Miss America

Sharlene Wells, the reigning Miss America, brushes up on her astronomy with the help of a Commodore 64 and Dr. Dan Kunz, executive director of government marketing for Commodore Business Machines. Miss Wells was in Washington, D.C., to attend a formal dinner for the Young Astronaut Program.

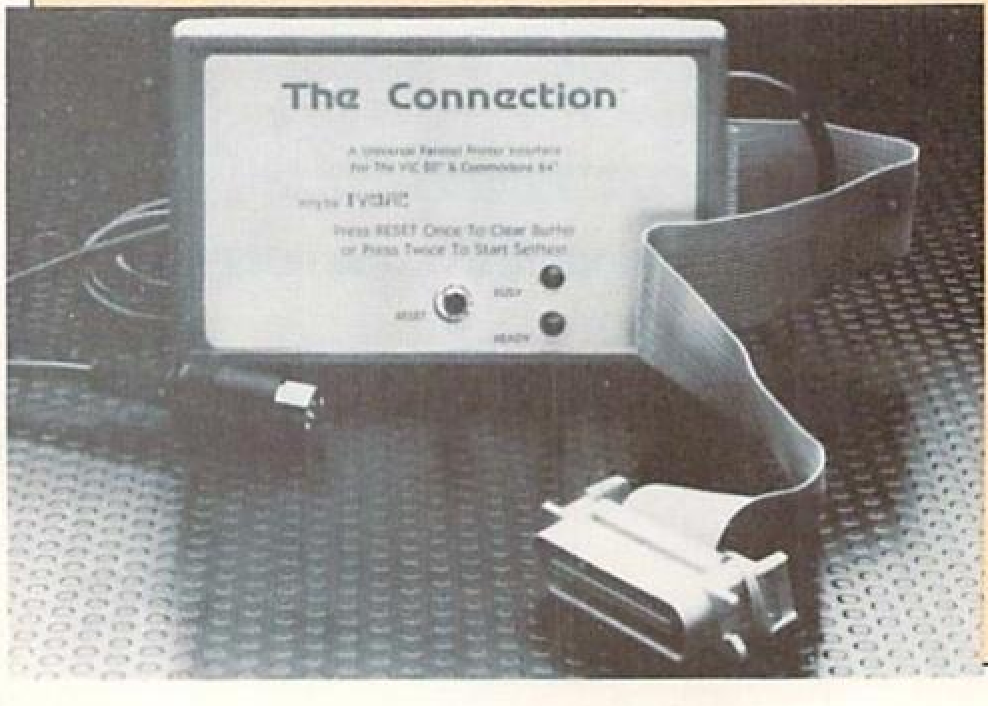
The program, established by President Ronald Reagan, is a nationwide effort to encourage student interest in science and mathematics by involving young people with America's space program. Commodore is one of seven sponsors of the Young Astronaut Program. For more information on the program, see the March/April 1985 **Commodore Microcomputers**.

Parallel Printer Interface

The Connection, a parallel interface for the VIC 20, Commodore 64, Plus/4, and Commodore 16 by Tymac Controls, is designed to let you use your Commodore computer with many popular printers. The Connection plugs into the serial bus just like the standard Commodore printer. It provides two modes of control for printer features. In emulation mode, control key sequences are automatically translated for your printer. In transparent mode, the Connection passes these sequences through to use your printer's features.

The Connection translates Commodore ASCII to standard ASCII and either displays full graphic characters or converts them to equivalent representations in clear text. It supports or converts them to equivalent representations in clear text. It supports all of the standard commands (OPEN, PRINT # and CLOSE), column tabbing, dot tabbing, graphics repeat, dot-addressable graphics and other features of a Commodore printer. Plus it gives you a 2K buffer, a full printer self-test, LED status indicator, printer reset switch, skip over perforation, margin set, and programmable line length.

When sending text, the Connection interfaces with virtually any parallel printer that uses a standard Centronics-type configuration and connector. For graphics, each printer requires a special version of the Connection. Additional ROM's are available from Tymac to adapt the Connection to different printers. (Tymac Controls, 127 Main Street, Franklin, NJ 01416)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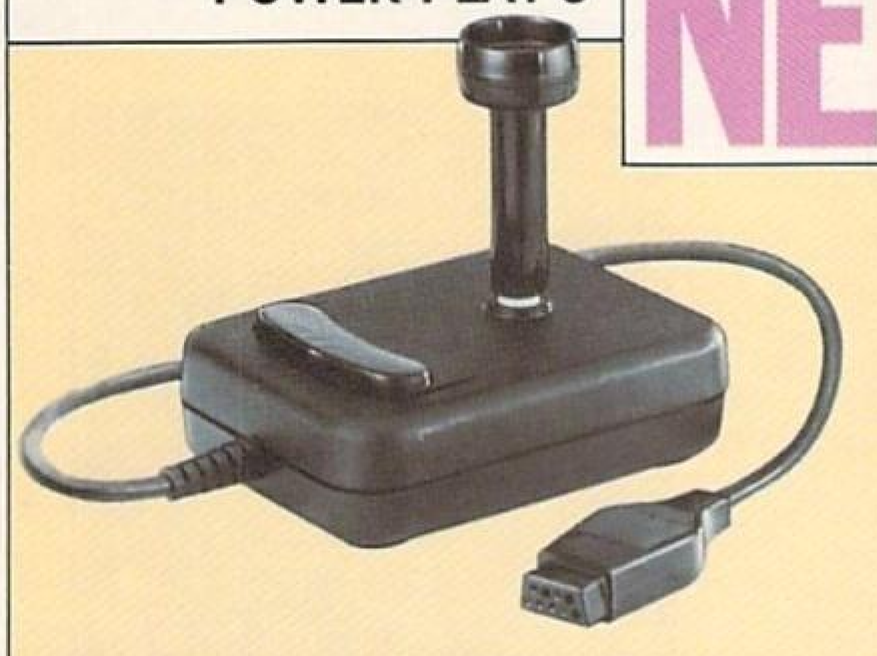
POWER PLAY'S NEWS FROM THE FRONT



New Joystick

The new Competition PRO 200X joystick from Coin Controls features a spring switch mechanism for reliable eight-way directional control, a quick response fire-bar integrally molded into the case, and an extra-long five-foot cord. The result is an economical, yet reliable joystick. The Competition PRO 200X joystick's suggested retail price is $8.95. Model 200 is covered by an unconditional two-year warranty. (Coin Controls, 2609 Greenleaf Avenue, Elk Grove, IL 60007)

Floppies to Flippies

Sight and Sound is turning two of its floppy disk programs for the Commodore 64 into flippies. All the existing features of the **Kawasaki Rhythm Rocker** and the **Incredible Musical Keyboard** have been condensed to one side of a disk, and new bonus programs have been added to the other side at no extra cost.

Kawasaki Rhythm Rocker now incorporates a number of additional features which were most frequently requested by users. A new notation system enables the music the user plays to be shown on the screen. Also, the bonus program can record and overdub up to 750 notes. To complete the package, the new program also includes a score printer that prints out the composition.

Other new functions include the ability to change voices while playing, transpose to any of 12 keys, and use a multitude of specially created effects. And for those users who aren't perfect, there's an auto-correct feature. Any notation played out of time will be corrected on-screen.

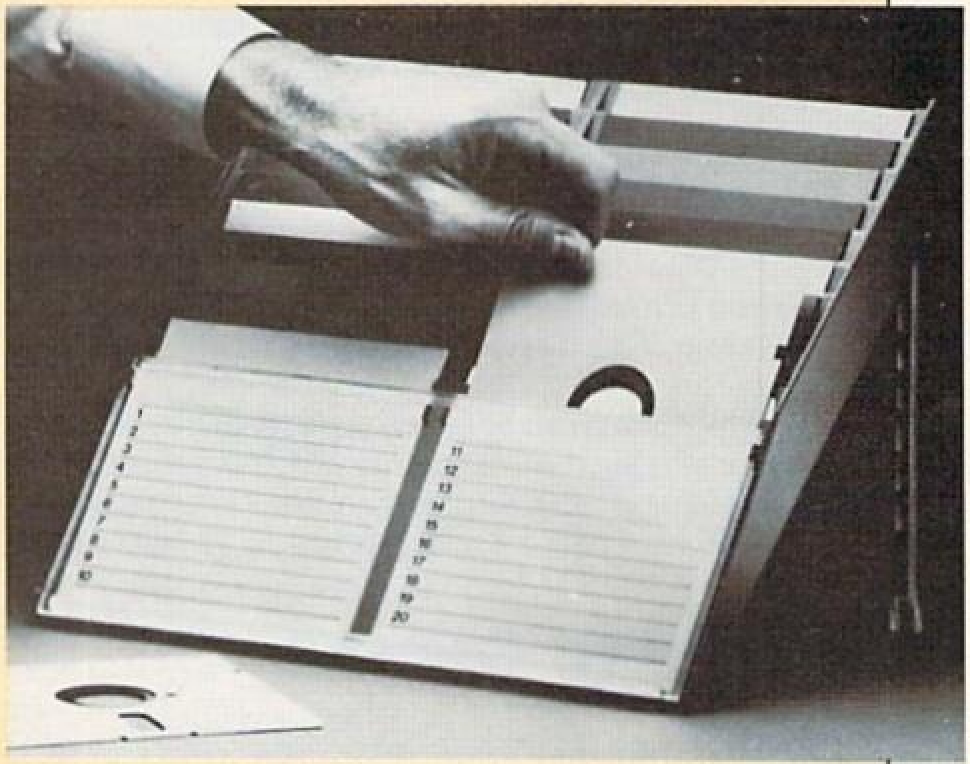
The new double-sided **Rhythm Rocker**, containing both original and bonus programs, will retail for $34.95; owners of the original **Rhythm Rocker** can upgrade to the new program for just $15.00.

The new **Incredible Musical Keyboard**, including the new double-sided program, documentation, keyboard overlay, and two music books, will retail for $39.95. Owners of the original program can upgrade to the new one for just $7.00. (Sight and Sound, 3200 South 166th Street, New Berlin, WI 53151)

Portable Disk Holder-Organizer

Potomac Industries has introduced the DiskPorter, a portable disk holder-organizer that doubles as a copy stand, hangs on the wall, slips into drawers, or stores as a book.

The 5-1/4-inch floppy disk holder uses a patented stair-step design to keep the labels exposed on all 20 disks. With its cover flipped back as an easel stand, it doubles as a copy holder without wasting work space. Closed, it can lock into a desk drawer for maximum security or slip onto a bookshelf. With rear keyholes, it is easy to hang. Index cards slip behind its clear slope-front cover to make it easy to select the right diskette from a case and the right case from a stack. The organizer retails for $29.95. (Potomac Industries, 2300 M Street NW, Suite 400, Washington, DC 20037)

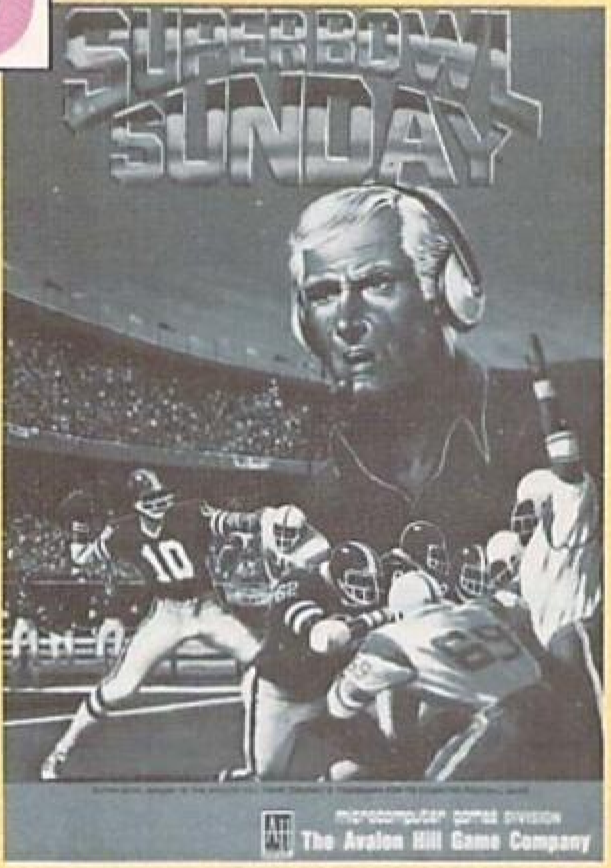


New Programs from KIDware

KIDware, manufacturer of low-cost software for children, has released 60 new programs for the Commodore 64. This brings KIDware's total to over 100 programs for children ages one to sixteen. Each program is non-violent, educational, and inexpensive. Every program highlights the graphics and music of the 64.

The programs are available on both cassette tape and disk. Each KIDware tape or disk has two complete programs. The price for these packages is $9.95 (tape) and $11.95 (disk). (KIDware, P.O. Box 9762, Moscow, ID 83843)

POWER PLAY'S NEWS FROM THE FRONT



Super Bowl Sunday

Avalon Hill Microcomputer Games has released **Super Bowl Sunday**, a sports simulation for the Commodore 64 in which you call the plays, you plan the strategy, and you maneuver the players. **Super Bowl Sunday** gives you the 20 greatest Super Bowl teams of all time, including the players' names and positions. You see the strengths of each offensive versus defensive matchup based on seasonal performances. Individual players' performances and statistics are updated throughout the game. You can view them during and after the game on-screen or keep permanent records using the printing option. This game gives you all 22 players on the screen at once, going through the actual play in animated action. You can play head-to-head against another live opponent, play solitaire against the computer, which is programmed to react to your strategy, or set the computer on auto-play and watch the computer play against itself. The game retails for $30.00 (Avalon Hill Microcomputer Games, 4517 Harford Road, Baltimore, MD 21214)

Lode Runner Sequel

Synapse Software, a division of Broderbund, has released **Lode Runner's Rescue**, a game for the Commodore 64 that follows in the footsteps of **Lode Runner**.

In this strategy game, Alexandra, the daughter of the famous Lode Runner, is being held prisoner deep underground by the evil Bungeling Empire. She must successfully negotiate 46 mazes on the way to her father's prison cell, picking up keys as she goes. The character is completely unarmed, so the player must rely on quick reflexes and even quicker wits to avoid the threatening guards and complete each maze.

In addition to 3D action and sound effects, **Lode Runner's Rescue** also includes a built-in game editor. Simple graphic icons help the player design and construct an unlimited number of mazes full of elevators, hidden trapdoors, enemy guards and rushing rivers. The best of the mazes can be play-tested and then saved permanently to be played again.

Suggested retail price is $29.95. (Broderbund, 17 Paul Drive, San Rafael, CA 94903-2101)

Electronic Novel

Synapse Software, a division of Broderbund, has released **Essex**, the second in its series of Electronic Novels for the Commodore 64.

Essex is an intergalactic search and rescue mission that takes place aboard a starship hurtling through space. Surrounded by an unlikely crew of fellow adventurers, the player must rescue the one scientist capable of preventing the imminent destruction of the universe.

The Synapse Electronic Novels are published as hard-cover books that set the scene and introduce the main characters of each story to the reader, who then loads the enclosed disk. The novels are written by teams of professional authors and noted game designers using Synapse's own parser system that is capable of recognizing 1,200 to 1,500 words.

Suggested retail price is $39.95. (Broderbund, 17 Paul Drive, San Rafael, CA 94903-2101)

Guide to Games

Hundreds of computer games line the shelves of software stores. Which ones do you choose? **The Greatest Games: the 93 Best Computer Games of All Time** by Dan Gutman and Shay Addams is a game-player's guide to adventures, simulations, and all the best electronic games.

The Greatest Games provides in-depth reviews of 93 computer games. Eighteen game categories are covered, from sports games to games that really fit no category. War games, driving games, maze games, adventure games, rescue games, and shoot-em-ups are just a few of the categories. There are concise examples of game play, and details of the strengths and weaknesses of each game. The book lists all the manufacturers and their addresses.

The Greatest Games is published by COMPUTE! Publications and retails for $9.95. (Compute! Publications 324 W. Wendover Avenue, Suite 200, Greensboro, NC 27408)

More News on page 127

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THE MICROWAFER ENTERTAINER: $119.95
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ADVENTURE ROAD

BY SHAY ADDAMS

Put an Orc in Your Party

News and opinion from a leading explorer of those fantasy realms known as adventure games.

While quaffing a mug of Dragon's Breath ale at the Adventurers' pub last week, I overheard a dwarf telling his pals that *Wizardry*, the legendary role-playing game for the Apple, is being converted for the Commodore 64. (That rumor has been circulating for at least a year, but the publisher of *Wizardry*, Sir-Tech, says there are no such plans in the foreseeable future.) I suggested that the dwarf look into Strategic Simulations' new *Phantasie* for real excitement. Written by Winston Douglas Wood, it successfully captures the spellcasting *Wizardry* spirit without degenerating into just another clone.

Phantasie's quest involves finding the Nine Rings of Power, necessary to defeat the Black Lord and liberate the land of Gebnor. The first step is organizing a well-balanced band of humans, dwarves, elves, halflings and gnomes—and for the first time in role-playing history, you can even enlist orcs, kobolds and other monsters as members of your party! These creatures may be designated as fighters, priests, magicians, rangers and similar "job classifications," and up to 37 characters can be stored on disk.

Character creation and related tasks (shopping at the armory, training to advance characters to higher levels, learning new magic spells) are carried out via all-text menus while inside any of the towns. Leave town and a split-screen display portrays a bird's-eye view of the countryside or current maze on the right (as in *Ultima*), and your gang on the left. In Gebnor's ten mazes, you can search for the 20 clue-filled scrolls, gold, rubies and other treasures.

Above and below the surface, you constantly encounter death-dealing orcs, dragons and other fiends. Up to a dozen or more creatures appear. From a menu, you choose combat options for each character: magic-users may cast one of 54 spells, and fighters can thrust, attack, lunge or parry. Minimal animation and sound effects heighten the drama as your orders are executed. Unlike *Ultima*, *Phantasie* offers the option of fleeing the scene instead of forcing you to fight to the finish. There's no disk access during combat, so you spend more time playing and less time waiting. And though the geography is vast and the mazes are complex, clever presentation techniques eliminate the tedious process of drawing maps.

Phantasie's plot, logical puzzles, and character interaction distinguish it from typical role-playing games. The story line, inspired by J.R.R. Tolkien's *Lord of the Rings* fantasy novels, unfolds gradually as you complete various mini-missions and subgoals that are assigned by various characters you meet in your travels. While exploring a maze representing a castle or cave, you run across white dots that trigger text messages from the residents. A gnome may ask a question, then offer a choice of three responses. You press the appropriate key to select an answer that, if correct, elicits valuable information. Puzzles from one maze are often tied in with those from another; this kind of interaction makes for maddening fun. Plan on spending months in this world-class fantasy world.

Infocom's *Wishbringer*

The tale of a mailman who must recover a cat kidnapped by an evil witch, *Wishbringer* mixes magic with a bizarre sense of humor and excellent prose. A magic stone grants you seven wishes (for advice, foresight, luck, and so on) that make the game easier for beginners to complete. All the problems can also be unraveled with logic alone, but this is more difficult. But even without the wishes, *Wishbringer* remains so simple that seasoned adventurers will wrap it up overnight. Hardcore Infocom fans are therefore advised to wait for the next game. If you know someone who wants to try adventuring for the first time, point them in this direction.

In the last issue, I said Infocom was enhancing its parser (the vocabulary and sentence structure an adventure game understands). The only detectable difference in this game is a subtle one. Previously, the parser understood a pronoun only in reference to the last noun you used in a command: if you first said, "Examine the trapdoor," you could then say "Open it." In *Wishbringer*, you can immediately say, "Open it." If you enter a room containing just one object, you just say, "Get it." This also applies to characters. When the troll asks you for something, you can say, "Give the cat to him" without having ever said "troll." No major breakthrough in parsing, the capability simply makes communicating with the program a bit more convenient.

Still relying on a two-word parser, the most intriguing and best-illustrated graphic adventure of the season is a conversion of American Eagle's *Sherwood Forest*. As Robin Hood, you'll have to outfox the King's tax collector and sidestep the Sheriff of Nottingham while trying to win the heart of Maid Marian. It features brilliant cartoon graphics (the reason the game is called a "softoon"). The conversion surpasses the original by making the most of the SID chip for sound effects and utilizing sprites for spot animation. With unusually logical and well-structured puzzles, this one is approachable by novices, yet challenging enough for pros.

Other recent conversions include a pair from Penguin, *The Quest and Xyphus*. *The Quest* entails a lengthy search for a dragon who is devastating a mythical land. It maps a large area, and has clever puzzles, characters, and effective spot animation. My only problem with *The Quest* is that the graphics fill in with color somewhat slowly, as was the case with Sirius Software's *Blade of Blackpoole*. *Xyphus* is an innovative role-playing game with six scenarios. When you complete one, the next loads from disk. It emphasizes war game-style tactics as much as strategy and spell-casting, and the lack of a "pool gold" or "trade weapon" option forces you to develop your four-member party as individuals. *Xyphus* was my pick as top role-playing game of the year when it was released in the summer of 1984.

For the Whole Family

Spinnaker has a couple of winners in its line of Windham Classics, *Below the Root* and *Swiss Family Robinson*. *Below the Root* is based on the *Green Sky* trilogy of children's books and employs joystick or keyboard control for swinging and jumping your character through the fanciful tree world of Green-Sky. Instead of typing words into a parser, you use the joystick to select commands from a menu at the bottom of the screen. The action aspect has an *Aztec* feel, but logical problems abound, so success doesn't hinge only on timing and reflexes. Additionally, you must develop your character's attributes as in a role-playing game, so it's really a hybrid.

Swiss Family Robinson is a graphic adventure whose friendly parser frequently supplies some of the words you would usually have to key in: If you type "put rope," the parser automatically adds the word "in" and waits for you to say where.

With 233 locations, you'd think this game would be map-making torture. But it's not, because an on-screen map appears when requested. Initially blank, the map fills in with different colors and patterns to indicate the areas you've visited; a blinking cursor shows your current position. These considerations make *Swiss Family Robinson* suitable for young players and families who want to play together. For an in-depth look at both these games, see the review in the July/August 1985 *Commodore Microcomputers*.

Spinnaker's *Starman Jones* and *Shadowkeep* were still "in the loop" as of this writing, and the company is adapting the science fiction novel *The Nine Princes of Amber* as a graphic game. Other new titles that should be reaching the shelves imminently include *Essex* (a science fiction Electronic Novel from Synapse) and *Crimson Crown*, Penguin's sequel to *Transylvania*. Until then, keep your sword sharp and your guard up—you never know what danger lurks behind the rocks alongside Adventure Road.

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REVIEWED BY TRACIE FORMAN-HINES

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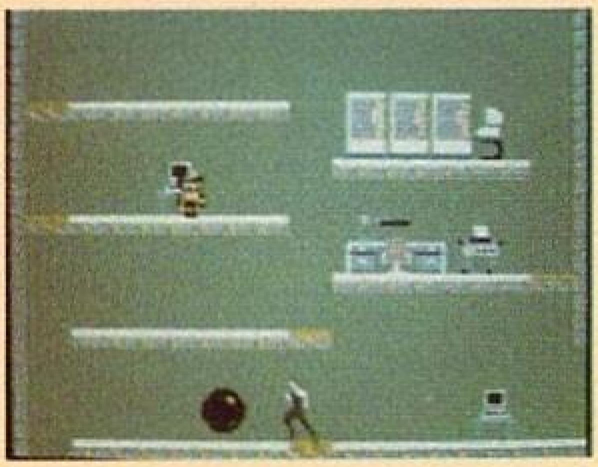
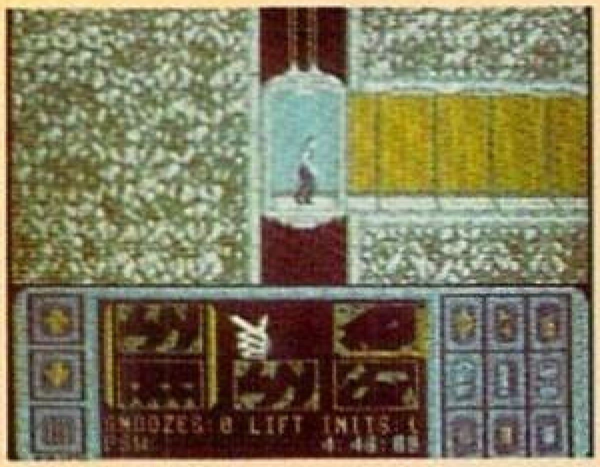
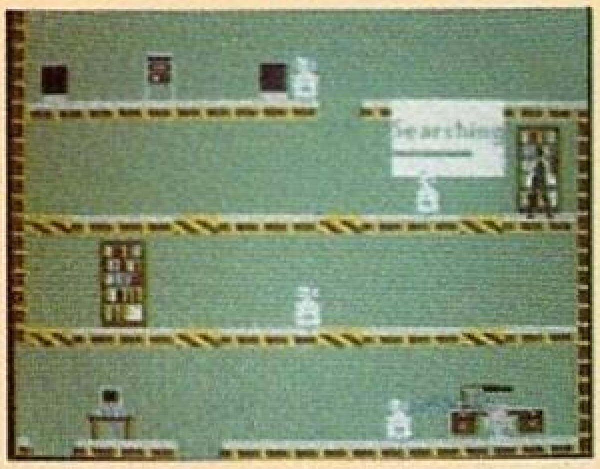
Medium: Disk
Price: Not Available

Nobody ever said that saving the world from violent destruction was easy. Nobody ever said it was possible.







This dazzling action-strategy thriller just might prove true to its name. It takes split-second timing and Olympic-class reflexes to find the tiny puzzle pieces hidden throughout the lair of evil genius Elvin Atombender. But without the ability to piece those puzzles together, even the most fleet-footed secret agent can't save the world from Elvin's doomsday machine.

Six hours are all you have to enter each of the several dozen rooms and search each piece of furniture for a hidden puzzle piece. Guardian robots patrol the rooms, some easy to avoid, others lethally precise. Each puzzle must be correctly pieced together to yield one letter of the ten-letter password you'll need to enter Elvin's hidden lair. It's no wonder that Elvin sounds so amused at the start of the game, when he greets the visitor with a Boris Karloff voice, "Another visitor! Stay awhile. Stay forever!"

The graphics and sound are both outstanding. The hero is depicted in high-resolution detail, executing a series of acrobatic leaps that would put any circus act to shame. Furniture in each room is colorful and realistic, right down to the books on the bookshelves. The robots toddle back and forth looking deceptively cute behind goggle-like glasses.

Though there's no music in the game, *Impossible Mission* offers speech synthesis, from Elvin's order to "Destroy him, my robots!" to the agent's anguished cry when he falls to his doom. Other sounds include the robots' electric-charged blasters and the agent's footsteps on the brick floors.

The location of each room within the complex varies from game to game. To explore the underground maze, the agent must find and use the elevators. Once inside a room, the agent must reach all the furniture on each level, either by jumping from one level to another or by using lifting platforms.

Each guardian robot has a slightly different personality, so it's a good idea to wait until you know how it will behave before approaching it. Some robots simply move slowly from one end of their platforms to the other; others might move slowly in one direction, but suddenly zip back across. Some have guns which they fire constantly, while others are more sneaky and wait until the agent approaches to scorch him with the withering energy blast. Still others do absolutely nothing but stand there.

Unlike many action-strategy type games, the player isn't limited to a set number of agents' lives. Each time an agent is killed, by touching a robot or its fire, or by falling through a hole in the floor, about 15 minutes of game time is lost. It pays to play cautiously, since less time is wasted when the agent carefully picks his way through a room than when he's killed outright.

Three types of items are hidden in the furniture: the most important are, of course, the puzzle pieces, but it helps to find a good number of passwords, which can either reset the lifting platforms in a given room or temporarily disable robots. A disabled robot is completely harmless and can be passed right through for as long as the "snooze" works.

Snooze and reset passwords can also be found in the two music rooms. Here, the gamer is played a series of notes which light up squares on a checkerboard. The object is to play the notes back from lowest to highest. Each time the agent successfully arranges the notes, he earns a password. Play as often as you like, because each successive series of notes is one note longer.

At least Agent Headquarters has issued each agent a handy-dandy pocket computer. This can be turned on with a simple press of the action button while the agent is in an elevator corridor. The agent can call into headquarters as often as he likes to get help. The pocket computer even features a work space to work on up to four different puzzles.

Nobody ever said that saving the world from violent destruction was easy. Nobody ever said it was possible. But even the most jaded action-strategy gamers will find plenty of challenge—and plenty of fun—in this *Impossible Mission*. C

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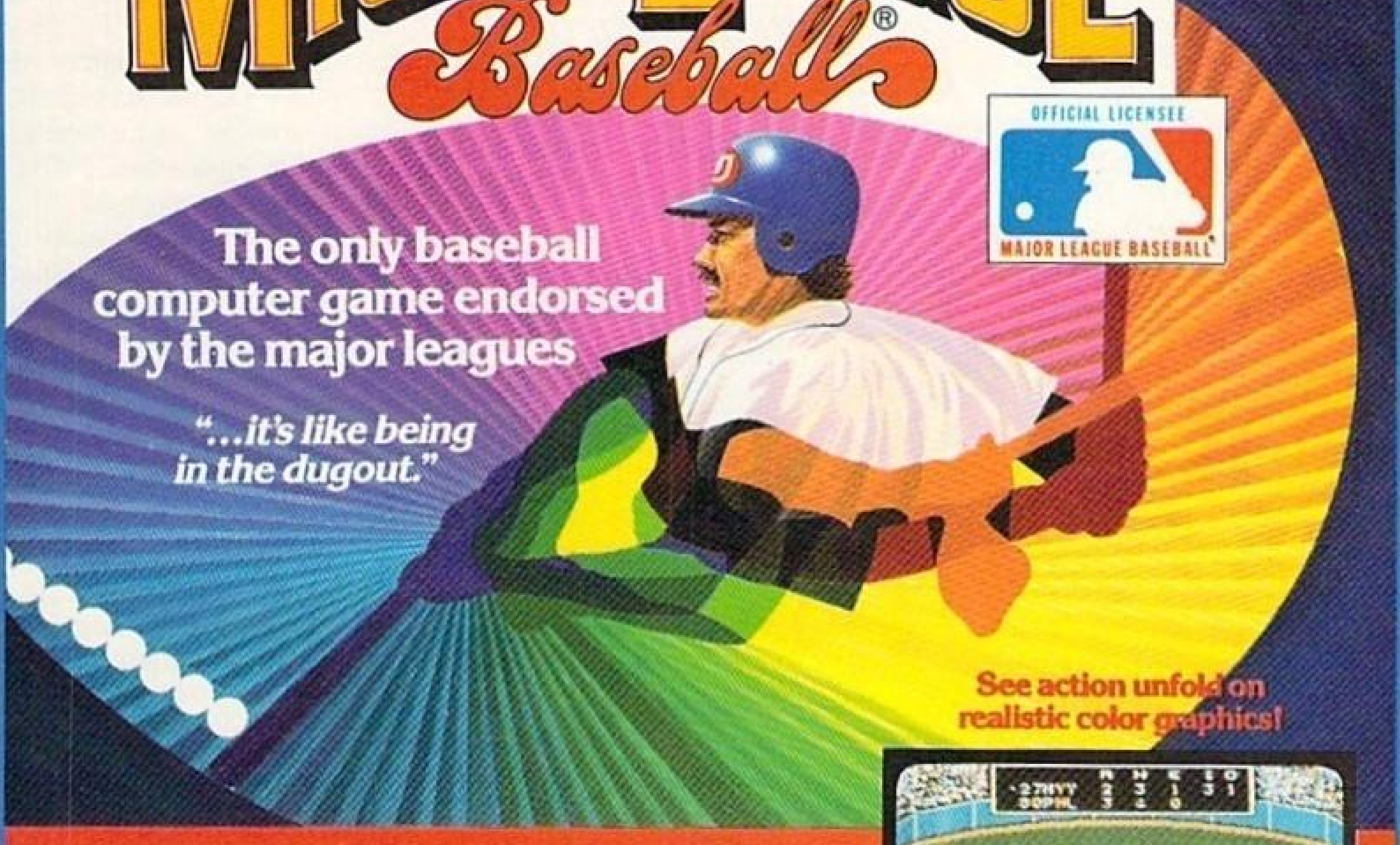

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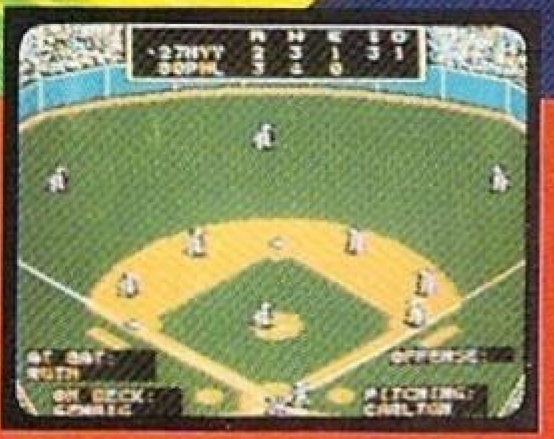

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REVIEWED BY TOM BENFORD

Mindshadow

Computer: Commodore 64
Publisher: Activision
2350 Bayshore Frontage Road
Mountain View, CA 94043
Medium: Disk
Price: $24.95

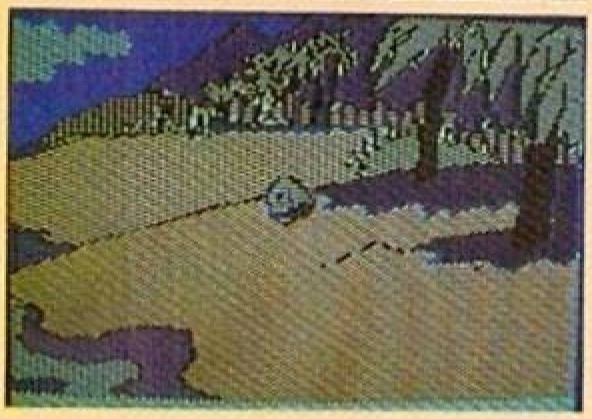
The graphics used lavishly throughout the text adventure game *Mindshadow* are superb, as is the vocabulary of *Mindshadow*'s parser, which understands complete sentences. Overall, the programming is outstanding, and Activision has paid attention to the smallest of details.

As with most adventure games, there is no pre-determined scenario: It unfolds as you explore, question and discover. Since your course of action will often result in a dead end, a provision for saving games in progress has been included. Up to ten different games may be saved to disk.

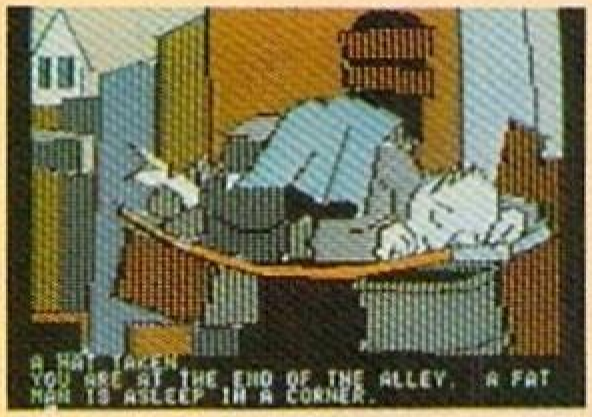
This particularly nice feature is called "quicksave." It lets you save your current game to disk *before* making a potentially dangerous move. In the event that your move results in your demise, you may reload the game up to that point with the "quickload" feature, provided it has been "quicksaved."

Two aids are incorporated into *Mindshadow* to help you solve the mystery of your identity and why you are stranded on a small tropical island. The first is the "think" feature, which allows you to recall fragments of information from your amnesiatic mind. As with most of the other game commands, this feature is implemented by typing in a verb/noun combination such as "think natives" (the program will also understand "think about natives"). Usually you won't be able to recall anything in particular, but it doesn't hurt to do a lot of thinking during game play. On the occasions you *are* able to recall something, this information will be invaluable.

The second aid is a strange sage called the Condor. This feathered know-it-all can be summoned by typing, "Help me, Condor." His aid should only be enlisted when you're absolutely baffled, though, since he'll only answer your call three times during an entire game. If you seek his counsel more than thrice, he'll tell you to "think for yourself."



Even with the help of the hint booklet, Mindshadow *is still one of the tougher adventure games.*



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A HAT TAKEN
YOU ARE AT THE END OF THE ALLEY.  A FAT
MAN IS ASLEEP IN A CORNER.
```

Along the way you'll come across artifacts—collect them without fail. While some of these artifacts are absolutely worthless, others are crucial to progress in the game. Some items by themselves won't do anything, but in combination with others, they may provide a solution.

If you do finally manage to get onboard a rescue ship, you'll then have to use your cunning and deductive reasoning to get off. The scurvy crew will anxiously test your mettle, so don't be afraid to be aggressive when you meet them—they only understand brute force.

Upon berthing in England, your trek will continue through the unsavory streets surrounding the piers. Intrigue, bribes and treachery await you during this leg of the journey. Remember to examine every item you come across and pay particular attention to the details of the text. Don't trust *anybody* here and keep your guard up—at least one attempt will be made on your life.

If you've been stalwart (and ruthless) enough, you'll be able to board a plane across the channel to Luxembourg. Hopefully, you still have most of the items you found along the way, because you'll need them now. You have to do some intensive "sleuthing" in this section.

The mystery will take several hours to solve, even for the most experienced adventure game aficionado. At several points during the game, I found myself completely baffled. When this happened, I simply stored the game in progress to disk and mulled over the situation until I felt inspired. Playing *Mindshadow* full-term could take days or even weeks to complete, perhaps more if you're new to adventure games.

Since the game is so demanding, Activision has thoughtfully made a hint booklet available for one dollar, to be ordered directly from them. The booklet, while providing information even the Condor won't tell you, doesn't provide all the answers, although it does point you in the right directions. But even with the help of the hint booklet, *Mindshadow* is still one of the tougher adventure games.

The function keys provide shortcuts for saving and loading games in progress, as well as summoning the Condor for help. The parser also understands shorthand directional commands, such as N, W, E, S, U (up), and D (down). Additionally, commands may be linked together, such as "N.N.W.N.," which will yield north, north, west and north moves. This is a handy feature for covering familiar ground traversed in a previous game.

I found *Mindshadow* to be an intriguing game that held my interest with its unexpected turns and deeply intertwined plots. After much effort and a generous bit of aid from the hint booklet, I was able to complete the game and find my true identity.

The best advice I can provide is to get your own copy of *Mindshadow*, send in a buck for the hint booklet, and lock yourself away for a weekend of heavy-duty adventure gaming. You'll be glad you did. C

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GAME REVIEW

REVIEWED BY RICK TEVERBAUGH

Breakthrough in the Ardennes

Computer: Commodore 64
Publisher: Strategic Simulations
883 Stierlin Road
Mountain View, CA
94043
Medium: Disk
Price: $59.95

September of 1944. It was a plan made from desperation. It was bold, it was risky. It could have altered the course of World War II. And it just might have worked.

The German army was near defeat. They were feeling a pinch from the British/U.S. forces on one side and the Russian troops on the other. They were badly outnumbered, but they had a plan: A quick strike from the Ardennes Forest through to the port of Antwerp would effectively cut off many of the Allied troops, not only from each other, but from supply lines. This offensive became known historically as the Battle of the Bulge.

Strategic Simulations has created a simulation of that offensive that is smooth and easy to play. There are three scenarios and four levels of play. The battle itself lasts for 12 days, but the game includes an option to play all 12 days, the first seven days, or the final seven days. The German forces must be operated by a human commander, and the computer will take the Allied side in solitaire contests.

At the easiest level, the German commander will be given more troops and higher replacement rates than would be technically accurate. The next level emulates history, and the final two make it even tougher.

Each turn represents a day and consists of a 12-step sequence. These steps include an air phase, supply phase, reinforcement phase, unit organization phase, operation phase, and combat phase. So if you thought it might be an electronic version of setting up little army figures and knocking them down, forget it.

Those of us who often daydreamed out the window in history class will find the rule book severely dog-eared by the end of the first game. It's not that the game is all that complicated. In fact, it couldn't be simpler. The program gives you all the choices, you merely enter a number. Deciding what is the best choice under the circumstances is the real test.

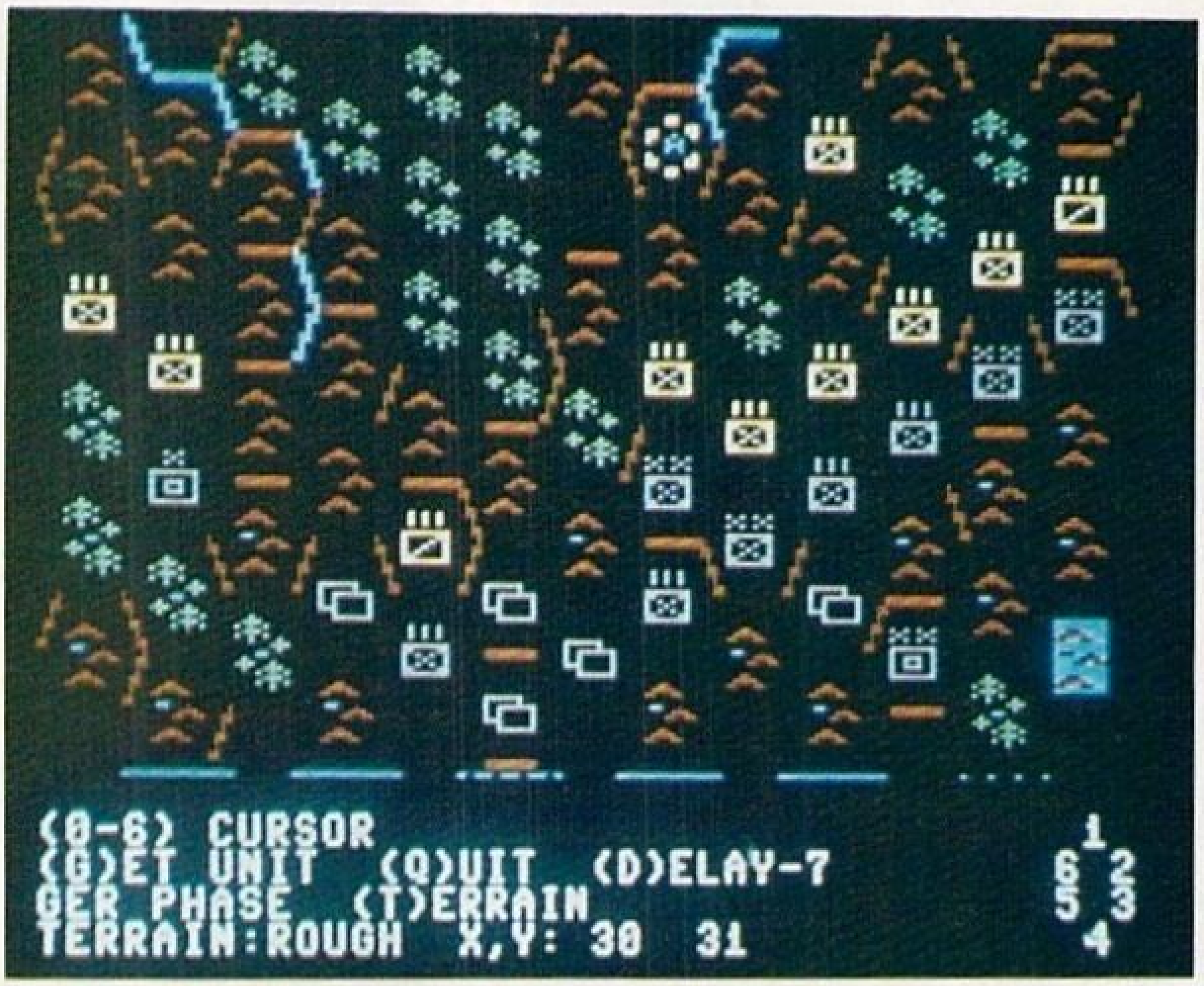
Those with war board game experience will fall in love with the game immediately. Graphically, the game does an outstanding job of recreating a hex-laden game board. Each hex is easily identifiable as to the terrain.

Since the computer handles all the calculations and troop movement in the game, you aren't forced to total the attack factors, subtract the defense factors, consult some tables, then roll the dice four or five times. The program handles all that drudgery and leaves you the time needed to make more important decisions.

And time is indeed another factor to consider. Game time is around 12 hours for this advanced level outing. Most likely, this will mean more than a few sessions and saves of the game to disk before completion. Battles against the computer tend to take a bit less time, and one of the shorter scenarios might be just the ticket for the uninitiated.

Those who demand realism from any type of simulation will find it here, right down to the weather conditions. This game isn't for beginners, and those who are looking to get their feet wet on some war games would do better to look to Strategic Simulations' *Tigers in the Snow*, which is an introductory war game that also depicts the Battle of the Bulge.

Breakthrough in the Ardennes comes with two map cards to help keep track of your troops and plan the next move. Maybe you've never envisioned yourself as a military commander, but if you have, this is a way to judge whether you missed your calling—or whether you are better off watching John Wayne, George C. Scott and Gregory Peck make the moves. ◼



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(0-6) CURSOR                          1
(G)ET UNIT  (Q)UIT  (D)ELAY-7        6 2
GER PHASE  (T)ERRAIN                 5 3
TERRAIN:ROUGH  X,Y: 30  31            4
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> *If you have ever envisioned yourself as a military commander,* Breakthrough in the Ardennes *is a fine way to judge whether you missed your calling.*

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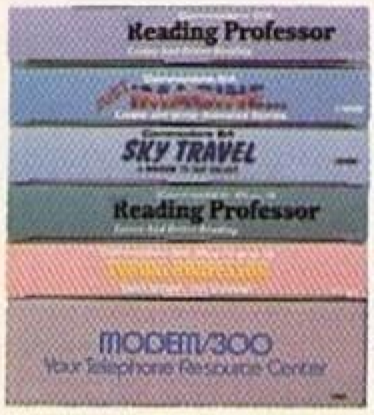
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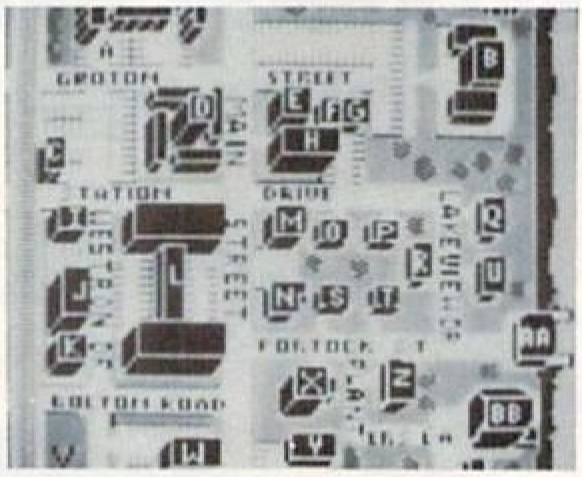
REVIEWED BY CHERYL PETERSON

Felony!

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Price: $34.95



The followup to *Murder by the Dozen*, *Felony!* contains another dozen mysteries. Although the rules are the same, this is not just a rehash of the same old stuff. Why, some of these mysteries aren't even murders. There are some thefts and a bombing thrown in to keep things interesting.

As a detective on the Huxley police force, you must gather enough information to determine who committed the crime, and, in some cases, why he or she did it. To solve the mysteries, you must extract clues from the witnesses' testimonies and locate supporting evidence. Three cases have a time limit, so you not only have to be smart, but quick as well.

Like its predecessor, *Felony!*'s graphics are interesting, but not overdone. The mystery plot is, after all, the central theme. For those of you who aren't familiar with the series, there is a police manual (instruction book). There is also a book of clues and another book with the solutions. Once the case has been explained, the investigating detectives question suspects, examine crime scenes, and figure out exactly who did it.

At each location, you may search for clues, question onlookers, or decide to go somewhere else. At the police station, you may read any relevant autopsy or lab reports if they are available. Whichever you do, a list of clue numbers will appear on the screen and you must look them up in the clue book. Depending on how many there are and what kind of evidence they provide, a certain amount of time will be added to your clock. After all, reading reports and talking to suspects does use up the minutes.

When you think you have the correct solution, look it up in the solution book. In the multi-player game, you must first explain your solution to the other players. Be careful not to be in too much of a hurry or you may look foolish. If you're right, the game's over; if not, the others continue without you, because you're off the case!

In a review of *Murder by the Dozen*, I noted that the case histories are printed in the manual that accompanies the program, but are also scrolled on-screen at the beginning of each mystery. It is a nice touch, considering these games can handle up to four players, because printing a case history on the screen lets everyone read it simultaneously. But for a one-player game, it becomes extremely tedious.

Felony! remedies this. In addition to an option to bypass the case history, the authors have put pauses in the on-screen printout. Since different players read at different speeds, it makes sense to be able to stop the scrolling at the ends of pages.

The features that I really liked in *Murder by the Dozen* live on in *Felony!*. The program calls each player by name. Like a good mystery, the program has believable characters. The mysteries follow a logical sequence. Information revealed about characters in one mystery can be useful in another, so it's a good idea to take them in order. Comments in the early case histories lead to the climax. And at the end of each case, the successful detective gets a Sleuth Rating, which is calculated by how long it took to solve the case and how thorough the investigation was.

Brainbank, the author of *Murder by the Dozen* and *Felony!*, has done a good job with both of their programs. I hope we see more from them. ◼

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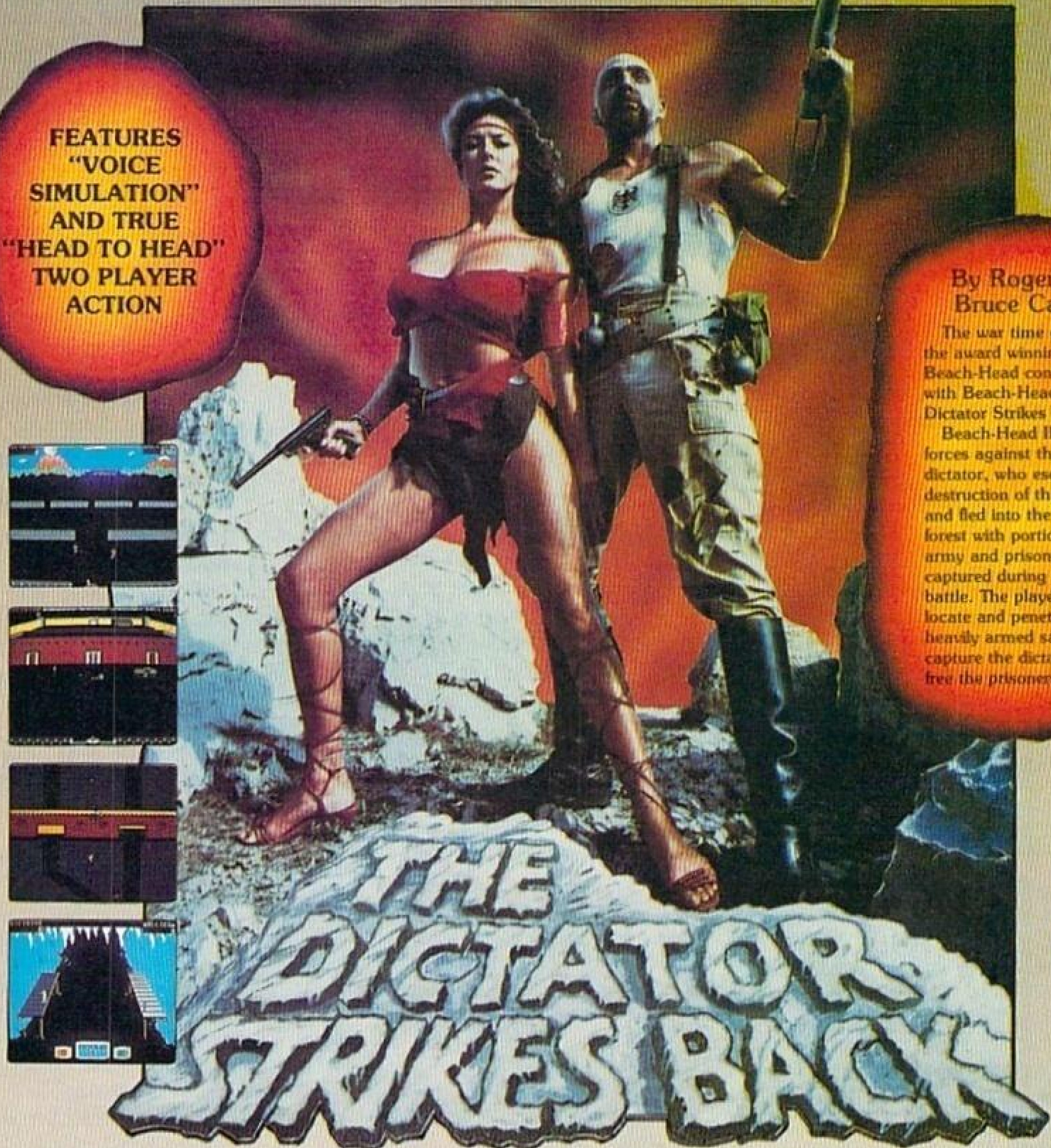
BEACH-HEAD II



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REVIEWED BY CHERYL PETERSON

Wordfinder

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Price: $34.95

> Wordfinder *gives you a chance to find new words and new mean -ings for old words.*

If you've ever taken several letters from one word and mixed them up to form a new word, you're prime to play *Wordfinder*. Designed for ages ten and above, *Wordfinder* challenges and expands your knowledge of the English language. It not only asks you to find new words within the old, but gives you a chance to find new meanings for old words. Here's how it works.

Wordfinder gives you a list of keywords; you pick the one you want to play. There are 24 in all. Some of these are further broken down, limiting you to naming only words with a certain number of characters. *Wordfinder* will then ask you to type in a subordinate word, one made using letters in the keyword. In the word RAIDER, for instance, you might find aid, dire, rid, ride, dare, red, raid, dear, read, air, die, and are. Can you think of any others? (How about ade and idea? Rare and rear?)

Each time you enter a word, it is checked against *Wordfinder*'s dictionary. If it's there, the word is added to your list at the bottom of the page and you can enter another one. If not, the program tells you.

The program is not foolproof, however. The authors chose to use only three dictionaries for determining which words are "real"; the *American Heritage Dictionary of the English Language*, *Webster's New World Dictionary of the American Language*, and *Webster's Third International Dictionary*. I understand limiting the correct responses, but this means that once in a while a word that you know is real is denied. Don't bother with "nerd," it doesn't work. Neither does "pal."

Wordfinder does have qualities that make up for its limited dictionary. Periodically, when you get a word right, you get bonus points. These are earned by choosing the definition that most closely identifies the word you've just used. There are four definitions from which to pick, and the other three can be used as clues to other correct answers. These definitions give meanings that will expand your vocabulary by introducing new ways to use old words.

Also, when you quit, the program will list all the words you didn't identify and allow you to check their meanings. In this way, you can further expand your vocabulary.

I have a good command of the language, yet there were a few words that caught me napping. Much research went into this program and it wasn't wasted. Improving your vocabulary is usually a dull process. Although *Wordfinder* isn't as entertaining as an arcade game, it is as challenging as a crossword puzzle or Scrabble. If you're tired of searching for just the right word, this program may help you find different shades of meaning or new uses for the words you already know.

Wordfinder can be played by one or two people and it calls both players by name. I don't know about you, but I hate the old "Player 1" and "Player 2" routine. Although there are no great graphics with this program, the congratulatory music that accompanies the bonus points is very nice. Then, of course, there is the obligatory, funeral-sounding dirge that goes with the display of the correct choice when you get something wrong.

As a mental workout, this program will certainly exercise the gray matter. See what playing this game can do for you. ■

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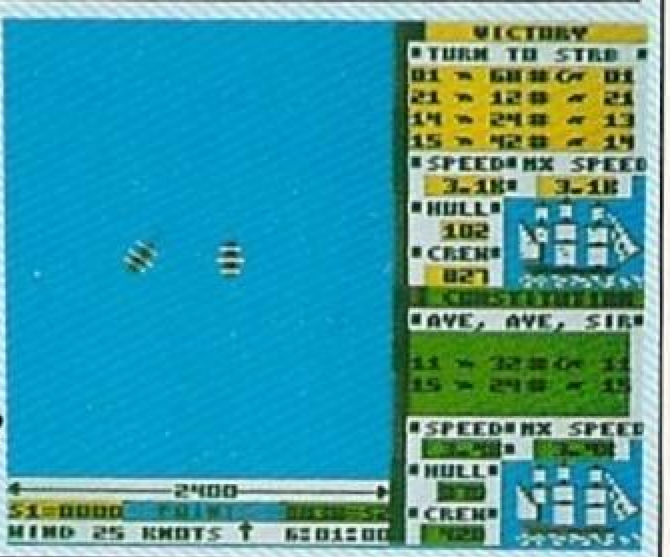
REVIEWED BY JEFF SEIKEN

Broadsides

Computer: Commodore 64
Publisher: Strategic Simulations
883 Stierlin Road
Mountain View, CA
94043
Medium: Disk
Price: $39.95

This simulation of single-ship combat during the era of fighting under sail melds historical simulation and arcade action.



Her sails rattling in the breeze, the Bonhomme Richard surged toward the H.M.S. Serapis. Less than 50 yards of open water separated the two ships. On signal, the starboard batteries of the Bonhomme Richard erupted in smoke and flame. The Serapis lurched under the impact, and smashed spars and rigging rained down upon her deck. The Bonhomme Richard fired a second broadside and her crew raised a ragged cheer as they saw the English frigate's main topmast splinter and topple over the side. Thus far, the day belonged to the Americans.

No, it is not a page from the history of the American Revolution, but a scene from *Broadsides* (with a few artistic embellishments, of course). *Broadsides* is a simulation of single-ship combat during the era of fighting under sail, which extended roughly from 1775 to 1815. It can be played against the computer or against an opponent. Besides the disk, *Broadsides* includes a superbly detailed 32-page rule book instructing the would-be John Paul Jones in this intriguing game of naval warfare.

Learning to play *Broadsides* takes practice, because the game moves continuously until one ship has been defeated. This means that you cannot leisurely consult the rule book once a game has commenced without leaving your ship captain-less. Several readings of the rule book and five or six run-throughs of the game will be required before you grasp even the rudimentary points of handling a full-rigged ship at sea. Take heart, you gain your sea legs slowly—captains have traditionally spent years at sea to master their craft.

The action in *Broadsides* occurs on the lefthand two thirds of the screen, which shows an overview of the two ships and the surrounding ocean at a scale of 600 or 2,400 yards, depending on the proximity of the ships. One piece of advice: It may be necessary to adjust the tint, color, and brightness of the monitor in order to be able to distinguish one ship from another.

On the right side of the screen is the status of the two ships. This includes current speed, the number of crew, hull factors, and the current order being executed. Silhouettes of the ships, which change as each suffers damage in battle, are provided as well. Ship captains pass orders to their crews either through the joysticks or the keyboard (which can be shared, because different halves are used to control each ship).

Not all orders, however, are executed immediately. Ships are rated at the speed in which they can carry out fire and turn commands, reflecting differences in crew and sailing qualities. For instance, a British 32-gun frigate takes only one and a half minutes to turn, and one and two thirds minutes to fire. In comparison, a 64-gun Spanish ship-of-the-line requires more than two minutes to do either one.

There are two kinds of time that players of *Broadsides* need be aware of—game time and real time. The ten possible speed settings determine how much game time will pass in one second of real time. At the fastest setting, one second of real time equals approximately 60 seconds of game time. At the slowest pace, the two become equivalent, which means that a battle lasting six hours of game time will take just as long in real time. The slowest setting is not a desirable choice even when learning the game.

Solitaire players should be forewarned that at the faster settings, the computer plays the same high quality game, but simply faster. Tough to beat at any pace, the computer can literally sail rings around a player at the top speed rating. A moderately fast setting of three or four offers a far more balanced contest.

Broadsides also includes two different game versions. In the arcade version, ships all turn and fire at the same rate and guns do double damage. Games, therefore, tend to be fast and furious with a victor emerging after only a few minutes of real-time play. The tactical version, on the other hand, takes into account the different turn and fire speeds of ships and increases the number of available commands. Ships can now raise full or battle sails, and load their broadsides with different types of shot. As the name implies, the tactical version adds considerably to the tactical richness of the game. Battles last longer and involve more intricate maneuvering, and victory goes to the player who handles his ship with the greater skill, forethought, and aplomb.

A further option allows players to guess the range to opposing ships from among three possibilities when firing their own ships' guns. This also results in longer contests and still bolder and riskier maneuvers, since ships will no longer be blasted partway out of the water with each enemy broadside. However, this option is not recommended for solitaire play, since the computer never seems to make an incorrect guess.

One last note about the game mechanics: Should the ships collide, the

Continued on page 120

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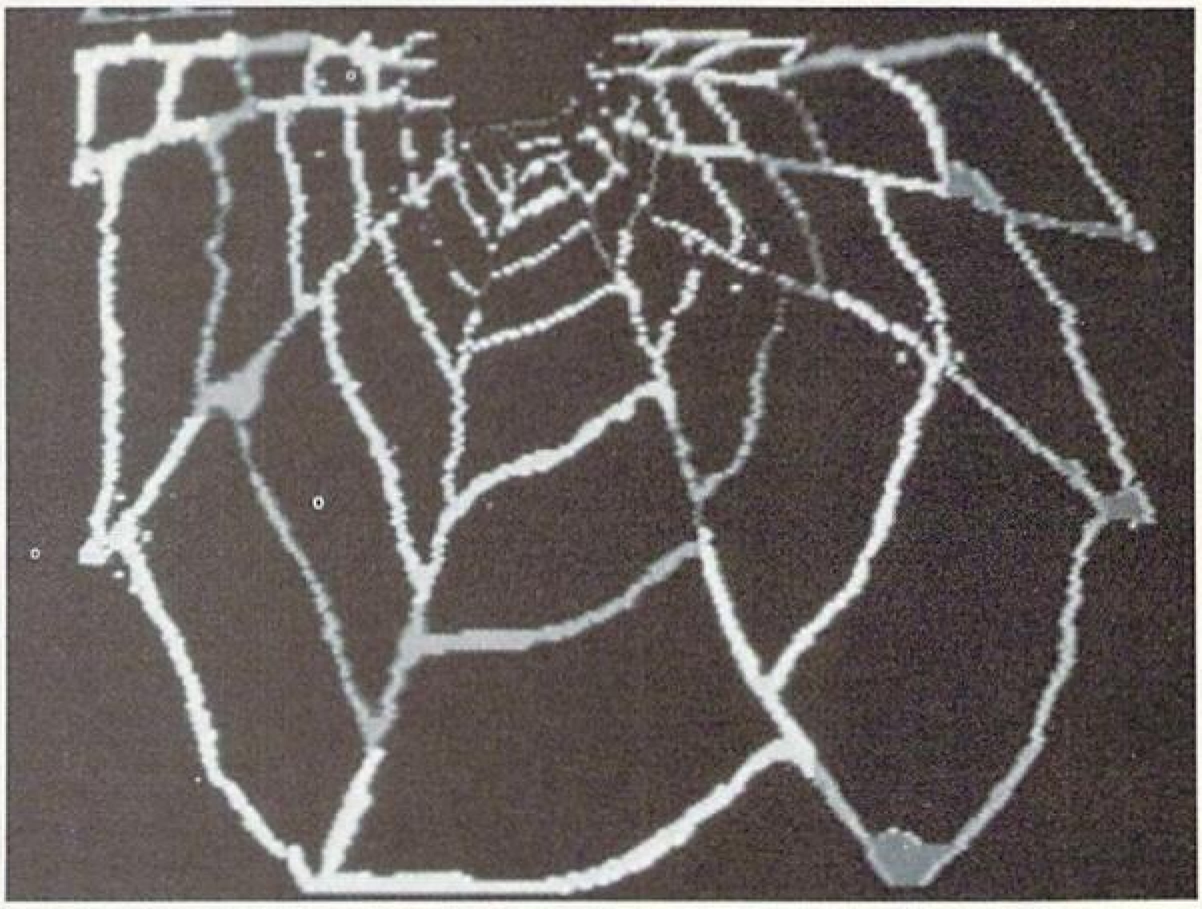
REVIEWED BY BOB SODARO

Web Dimension

Computer: Commodore 64
Publisher: Activision
2350 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Price: $24.95



With the introduction of Russell Lieblich's *Web Dimension*, we now have what Lieblich describes as "Zen gaming." "Zen gaming" is a game where there is no score, an unlimited amount of video-generated players, and no time limit. In short, you boot the game up, play as long as you like, and shut the system down when you're done.

Web Dimension is a musical fantasy of color, sight, and sound. The game field, as the title suggests, is an eerie-looking spider's web that originates from the top center of your monitor, and spreads out and downward, giving the game a 3D look.

Since there are no points to be accrued, the object is to move along the web, through eight levels of musical evolution (atoms, planets, amoebas, jellyfish, germs, eggs, embryos, and astronauts). Each level has three phases. In phase one, you must move your character (a musical note) across all organisms on the web, freezing them into energy clusters. In phase two, you must freeze the energy clusters themselves, again by crossing their paths. Phase three is your reward: You are treated to a musical light show featuring one of ten different pieces of music.

During the first phase of the game, the dimensional web is white on a black background. Your character appears in the lower right of the screen, with eight organisms located elsewhere on the web. Movement along the web is tricky at first, because the diagonal pattern of the webbing and the analog nature of the joystick. For instance, to move left, you pull the joystick at a 45 degree angle down and to the left. Once moving, your note will continue until the next junction of web strands.

Web Dimension *has no score, an unlimited amount of video-generated players, and no time limit.*

To freeze the organisms, you must meet them at the web junctions or nodes, and press the fire button. The organisms leave a colored trail, which disappears when they complete their cycle. If you hit this colored path, or an organism traveling between nodes, everyone will be zapped back to their starting position, and all frozen organisms will be freed.

On each level, the organisms will always proceed along the same paths, so it might be wise to observe them a while before tracking them (remember, there is no time limit). Once they have all been captured, the web changes to blue, and your note is returned to its starting position.

During the second phase, the action is reversed. You leave a colored trail and the energy clusters move freely about. This time, when freezing the clusters, you can stop them between the nodes. Again, if you touch a multi-colored path, the sequence will begin anew.

Phase three features a brief musical interlude. Sections of the web light up in sync with the music. The background strobes bars of color (usually black or blue and white) upward across the screen, enhancing the light show. Then the cycle begins anew with new organisms and different patterns. Each cycle is slightly more difficult.

By his own admission, Lieblich is a musician first, programmer second. He also wrote the musical scores for Activision's *Master of the Lamps* and *Rock 'N Bolt*. His reason for creating *Web Dimension* was the music and light show, with the gaming element almost secondary. "I'm not really into gaming, but I love music, so I designed a musical game that doesn't keep score," he explains.

For those of us (myself included) who could never make the top ten on the nuke-the-alien arcade games like *Space Invaders*, and who are enamored by music, take the spider's advice and enter his parlor. Perhaps Lieblich's only failing was to not include a Rod Serling-type introduction: "You have entered a world of color, sight, and sound...a musical fantasy on a multi-colored evolutionary web of your desires. . . you have entered. . . the Web Dimension."

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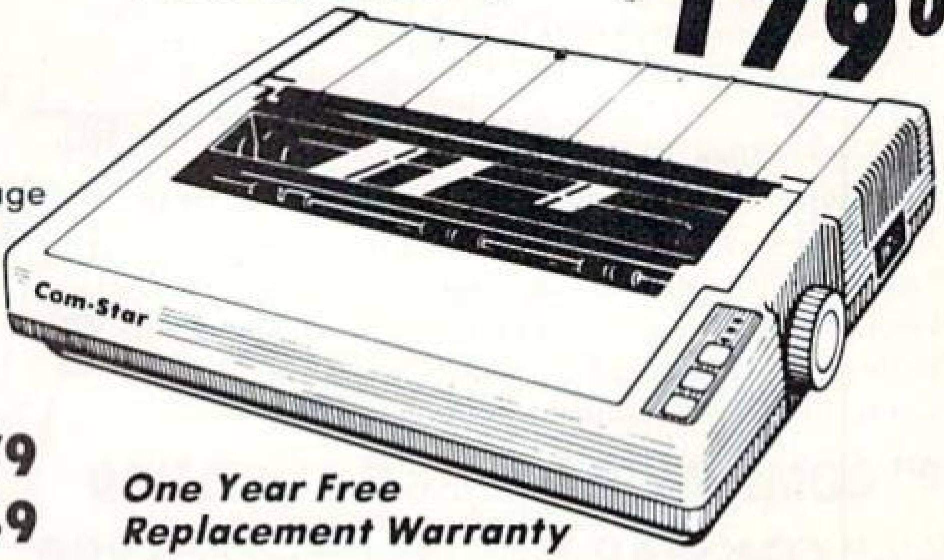

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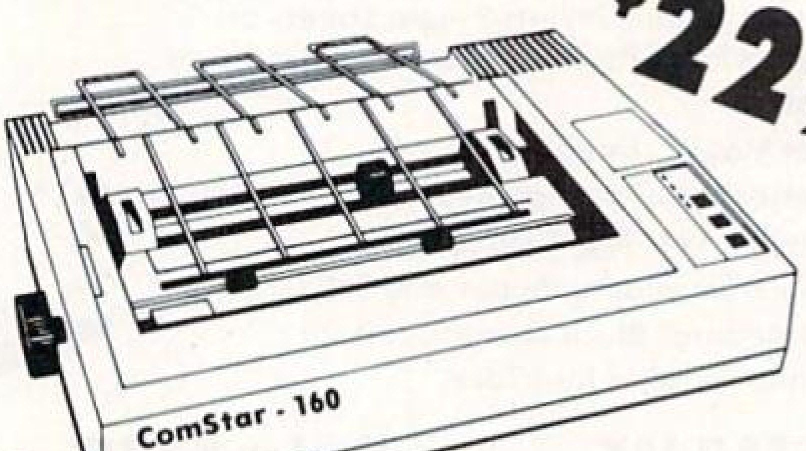

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- Letter Quality Mode 40 CPS
- 9x9 or 17x17 dot matrix
- 256 user definable characters
- Super script, subscript
- Pica, elite, proportional and italics
- Super bit image graphics
- 1920 byte print buffer
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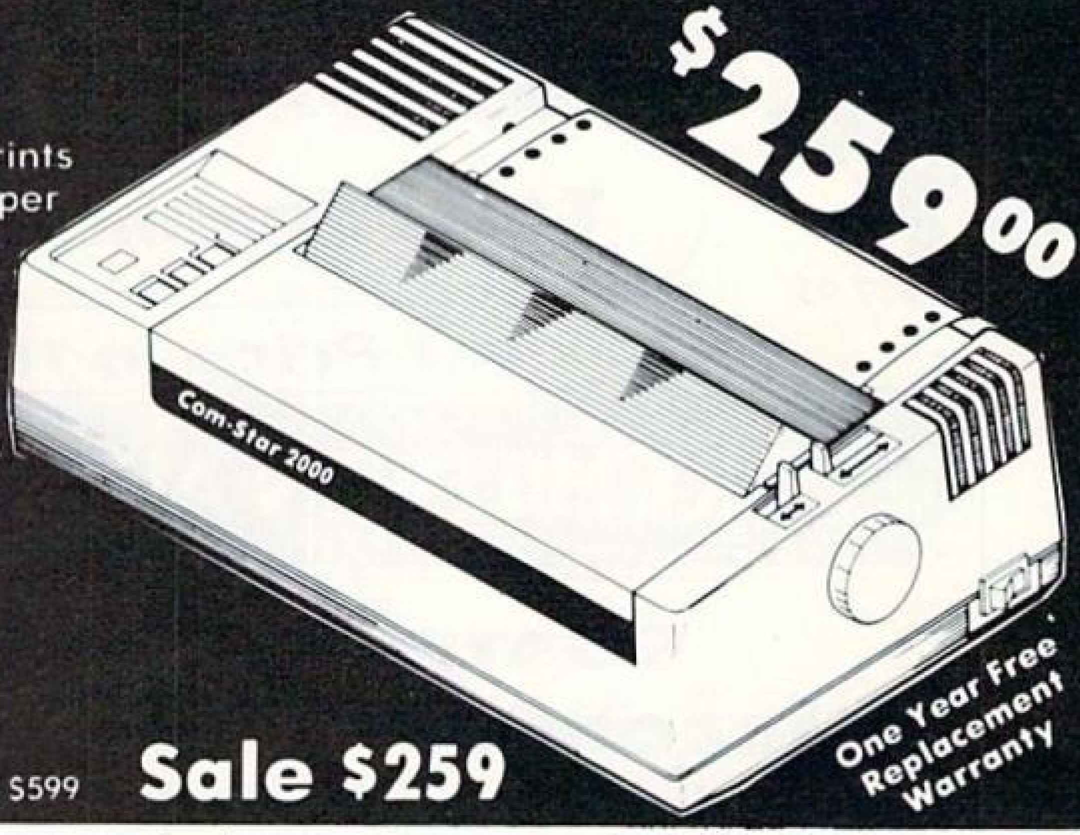
- Better than Epson FX80
- Automatic dark mode



$259.00

One Year Free Replacement Warranty

10" ComStar 2000 List $599 **Sale $259**

PRINTING METHOD	Impact dot matrix system
PRINT SPEED	160-180 cps PICA; 40 cps FINE MODE (Letter Quality)
PAPER FEED SPEED	100 msec/line (in case of 1/6 inch line feed)
CHARACTER FONT	9x9 matrix (pica, elite, condensed), 9xn matrix (proportional), 17x17 matrix (fine mode) 2 pass
BIT IMAGE GRAPHICS	480, 640, 960, 1280, 1920 dots/line
PRINT DIRECTION	Bi-directional in text mode with logic seeking Uni-directional in bit image graphic mode
CHARACTER PITCH	1/10" (pica), 1/12" (elite), 7/120" (condensed), 2/10" (double width pica), 2/12" (double width elite), 14/120" (double width condensed)
CHARACTERS PER LINE	137 characters (condensed) 96 characters (elite) 80 characters (pica) 68 characters (double width condensed) 48 characters (double width elite) 40 characters (double width pica)
HORIZONTAL TAB	Programmable positions & manual selection by control panel switches
VERTICAL TAB	Programmable
LINE FEED PITCH	1/6", 1/8", 7/72" (programmable pitch), 1/72" (programmable pitch), n/72" (programmable pitch), n/216" (programmable pitch)
CHARACTER SET	Full ASCII 96 characters with descenders. International characters: USA, Germany, Italy, U.K., France, Denmark, Sweden, Spain
PAPER FEED SYSTEM	Adjustable sprocket feed, friction feed
FORM HANDLING, FANFOLD PAPER	Width: 4-10"; number of copies, original & 2 copies without carbon
RIBBON	Cartridge ribbon
PAPER END SENSOR	Mechanical switch (printer stops printing 0.6 inches from end of paper)
INTERFACE	Parallel (Centronics compatible) Buffer memory size: 1920 byte
RELIABILITIES: PRINTER LIFE	MTBF: 5,000,000 lines; ribbon life, 3,000,000 chars.
DIMENSIONS & WEIGHT	Width 16.0"; depth 11.8"; height 4.72"; weight 14 lbs.

All product data subject to change without notice.

Parallel Interfaces: Commodore 64 — $39.00 Apple II,IIe,II+ —$59.00 Atari — $59.00

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Paperback Writer 64

40 or 80 Columns in Color

This is the easiest to use and most powerful word processor available for the Commodore 64. As you type on the screen, you will see your letters and words appear on the screen exactly as they will be printed (i.e. Italics will be *Italic*, Bold Face will be **Bold Face**). With the printer files you can customize Paperback Writer 64 to use all the fancy features of your printer. Loads EZ Script®, Paperclip®, & Wordpro 64® Files so you can easily upgrade your past wordprocessing text that you've written with obsolete wordprocessors. Take a look at some of the other features:

- **Wordwrap** — No Words Break At The Edge Of The Screen.
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☆ ☆ ☆ Plus ☆ ☆ ☆

Full help screens on line with additional help on the disks mean you don't even need a manual. If you're in the middle of a page and you want to know how to use a special function just hit F7 and the information will appear before your eyes. If you still don't understand hit F7 again and a more detailed explanation appears. Then simply hit F8 and you're back in the letter where you left off. No manual lookup necessary. This is the easiest word processor in the world to use. List $99.00.

Introductory Sale Price $39.95. *Coupon $29.95.*

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We are so sure this is the easiest and most powerful word processor available, we will give you 30 days to try it out. If you are not completely satisfied, we will refund your purchase price.

PAPERBACK DATABASE (Datafax) List $69.00. **Sale $34.95.** ** Coupon $24.95.*

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For those who want cadillac quality we have the Loran Floppy Disk. Used by professionals because they can rely on Loran Disks to store important data and programs without fear of loss! Each Loran disk is 100% certified (an exclusive process) plus each disk carries an exclusive FREE REPLACEMENT LIFETIME WARRANTY. With Loran disks you can have the peace of mind without the frustration of program loss after hours spent in program development.

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Just like a record needle, disk drive heads must travel hundreds of miles over disk surfaces. Unlike other floppy disks the Loran smooth surface finish saves disk drive head wear during the life of the disk. (A rough surface will grind your disk drive head like sandpaper). The lint free automatic CLEANING LINER makes sure the disk-killers (dust & dirt) are being constantly cleaned while the disk is being operated. PLUS the Loran Disk has the highest probability rate of any other disk in the industry for storing and retaining data without loss for the life of the disk.

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All LORAN disks come with hub rings and sleeves in an attractive package.

DISK DRIVE CLEANER $19.95

Everyone Needs A Disk Drive Doctor

FACTS

- 60% of all drive downtime is directly related to poorly maintained drives.
- Drives should be cleaned each week regardless of use.
- Drives are sensitive to smoke, dust and all micro particles.
- Systematic operator performed maintenance is the best way of ensuring error free use of your computer system.

The Verifin disk drive cleaner can be used with single or double sided 5¼" disk drives. The Verifin is an easy to use fast method of maintaining efficient floppy diskette drive operation. The Verifin cleaner comes with 2 disks and is packed in a protective plastic folder to prevent contamination. List $29.95. **Sale $19.95.** ** Coupon $14.95.*

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57% More Memory For BASIC

For the first time, the Commodore 64 computer owners can make use of the full memory that came inside their Commodore 64 without having to learn sophisticated assembly or machine language programming. The new S'more BASIC Cartridge allows BASIC programmers to use over 60K of RAM for BASIC programs. This 57% gain in available memory is not restricted in any way, it can be used for arrays, variables and BASIC programs which would over-load the capacity of an un-expanded Commodore 64. List $69.95 **Sale $49.95**

S'MORE (for Super Memory Optimized RAM/ROM Expansion) is a powerful cartridge-based program which provides...

- 61,183 bytes of C-64 RAM memory freed for BASIC programming (57% more than the 38,911 now free). This gain is not restricted in any way, and can be used for arrays, variables, and BASIC programs which would overload the un-expanded C-64's capacity
- Over 60 new and enhanced BASIC commands & functions
- Full error trapping, and an automatic error help which lists the error line and places a flashing cursor at the beginning of the program statement containing the error
- No peeks or pokes because S'MORE provides direct access to normally peeked/poked items
- Full up-down scrolling through program listings for easier program editing

Relative File Commands: DOPEN# & RECORD #. **Print Using And Other Formatting Tools:** PRINT USING, PUDEF (define format for the PRINT USING function), & PRINT AT (row, col.). **Full Error Trapping:** TRAP, EL (returns error line #), ER (returns error #), ERR$ (returns error description), RESUME, & RESUME NEXT. **Structured Programming Commands:** DO, LOOP, EXIT, UNTIL, & WHILE. **Formatted Input Commands:** GETKEY, INLINE, INPUT (improved), INPUT AT (row, col.), INFORM (limits allowed response keys and length of response). **Peeks & Pokes Not Needed:** Direct access to normally peeked/poked items is provided with commands like BORDER, PAPER, INK, VID(x) (x—screen memory location), COL(x) (x—color memory location), VIC(x), SID(x), CIA(x), NORM, UPPER, & LOWER.

A BRIDGE TO THE C-128: Commodore 64 owners get immediate memory expansion from S'MORE. S'MORE's command structure is similar to the C-128, allowing programmers to make use of advanced programming techniques available on the C-128's new BASIC 7.0 so that programs written on S'MORE BASIC may be more easily converted to run on the C-128.

Write Now! — Word Processor Sale $34.95

Easy To Use Cartridge Based Word Processor for the C-64, With Full 80 Column On-Screen In Color View Mode

The WRITE NOW! word processor provides you with the easiest to use, fastest to learn format available for your Commodore 64 computer. It will give you all the fetures you would expect in a professional word processor and some features not found in any other Commodore 64 word processor.
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- Program is on cartridge and loads instantly so there is no waste of time loading from unreliable tapes or disks.
- Built in 80 column display allows you to see exactly what you will print including headers, footers, justification, page numbers and page breaks.
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Spell Now — Spell Checker Sale $19.95

"Spell Now" is a disk based professional spelling checker that interfaces with the "Write Now" word processor for the C-64. Use "Spell Now" to check the spelling in your "Write Now" files. It includes all features of the most expensive spelling checkers on the market. (Disk) List $39.95. **Sale $19.95.**

Graph Now / Paint Now — Graphic/Logo Generator Sale $19.95

A full graphics package capable of generating line, bar graphs and graphic art designs such as logos and pictures to be used with "Write Now" for the C-64. Save your graph or logo in a "Write Now" compatible file and print it out along with your "Write Now" text file. (Disk) List $39.95. **Sale $19.95.**

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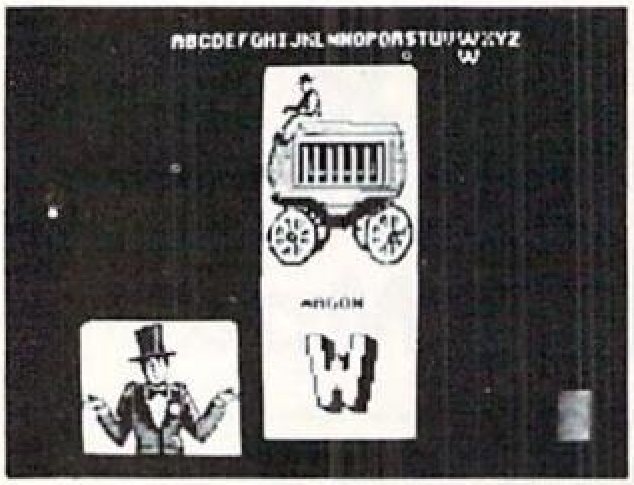
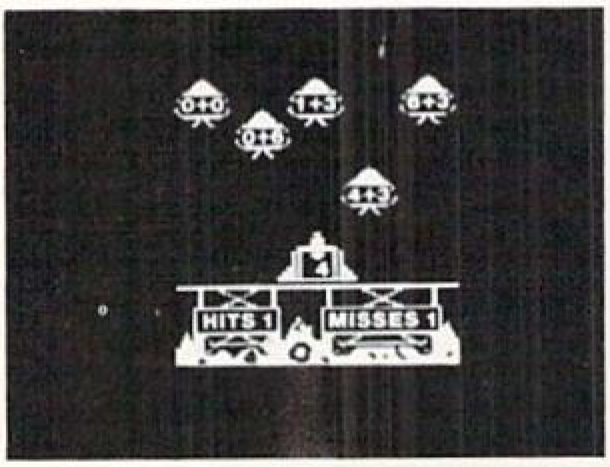


Alphabet Circus. All the color and excitement of the big top are here, along with play-and-learn activities that enhance letter recognition, alphabet order, and text creation. The six games for one or two players are: Alphabet Circus, Meet the Circus, Alphabet Parade, Secret Letter, Juggler, and Marquee Maker. (Disk) List $29.95. **Sale $17.95.**

Commodore 64 Sale

Alien Addition. The fast action and colorful graphics of arcade games motivate players of all ages to learn fundamental math skills. Alien addition provides practice in basic addition facts using an "Alien invasion" theme complete with spaceships and laser cannons. (Disk) List $34.00. **Sale $19.95.**



Spelling Wiz. A colorful wizard who uses his magic wand to zap missing letters into words, assists players in spelling more than 300 words commonly misspelled. (Disk) List $34.00. **Sale $19.95.**

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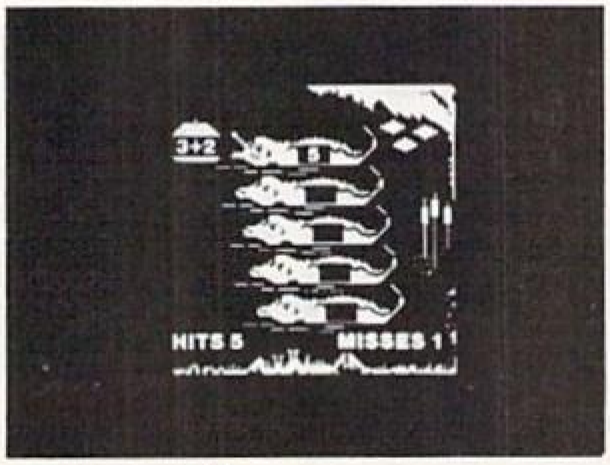
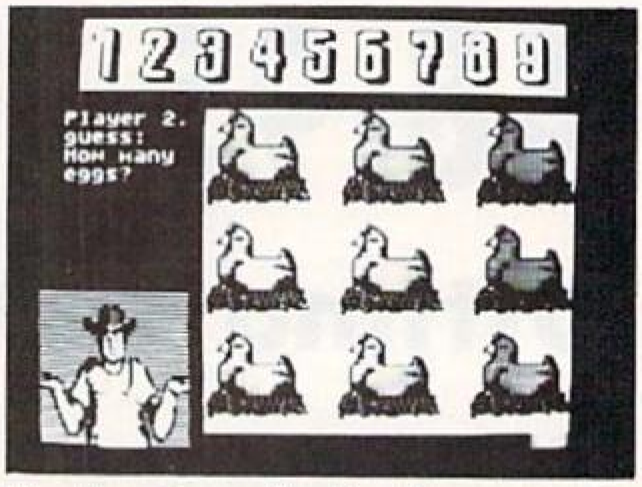
Early Christmas Sale

Alligator Mix. Players build skills in addition and subtraction as they feed hungry alligators. Very challenging, with great graphics. (Disk) List $34.00. **Sale $19.95.**





Number Farm. Here's a bumper crop of activities design to develop recognition of numbers and number words and an understanding of the concept of numbers. The six games for one or two players are: Number Farm, Old McDonald, Hen House, Animal Quackers, Horseshoes, and Crop Count. (Disk) List $29.95. **Sale $17.95.**

Commodore 64 Sale

Meteor Multiplication. Have fun blasting meteors, while learning basic multiplication facts. Requires motivation as players practice and are drilled in multiplication skills. Fast action and colorful graphics keep interest of all ages. (Disk) List $34.00. **Sale $19.95.**

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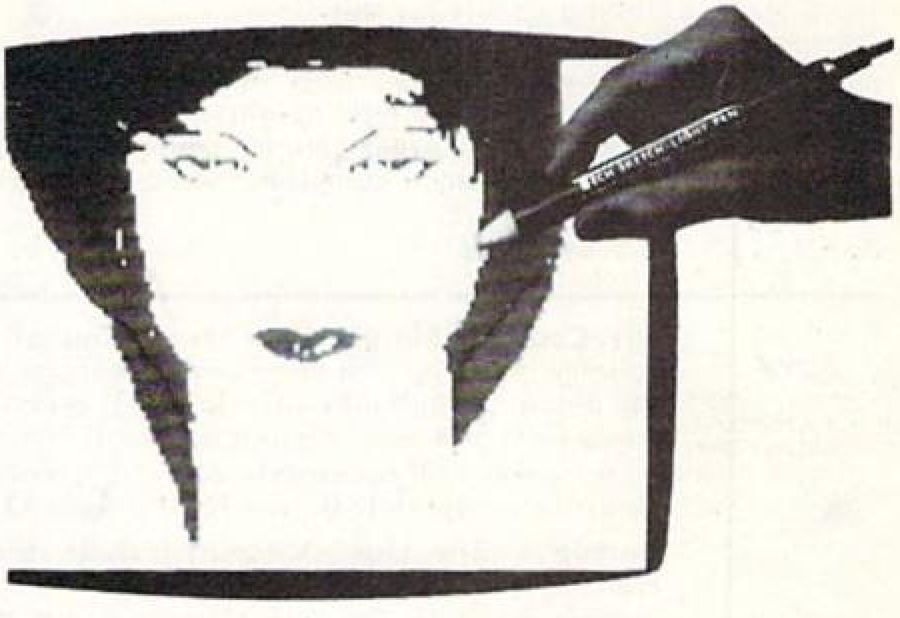
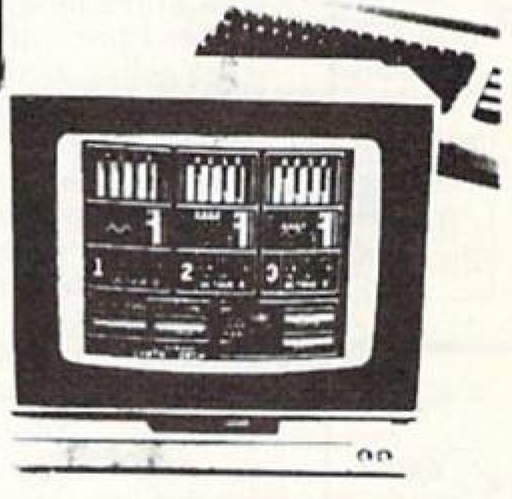
Sale! $37.95 **Hi-Resolution!**



Now you get this **Fantastic Tech Sketch Computer Light Pen Program** with a **Professional Light Pen Free!** ($39.95 value) plus the **Micro Illustrated Graphics Pen Program** that allows you to draw on your T.V. or monitor screen (better than Gibsons $99 light pen). Whatever you can draw on the screen you can print on your printer (A Tech Sketch Exclusive.) (Disk) List $59.95 **Sale $37.95.**

Also available is **Lite Sprite**, a light pen driven sprite builder (List $39.95 **Sale $29.95**).

MUSIC PORT



The ultimate music synthesizer and multi-track recording system for the Commodore 64. A **Full-sized REAL Keyboard** and all software including preprogrammed songs are included. (Disk) List $149.95 **Sale $99.00.**

Fully Responsive "MUSICIANS" Keyboard

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Software
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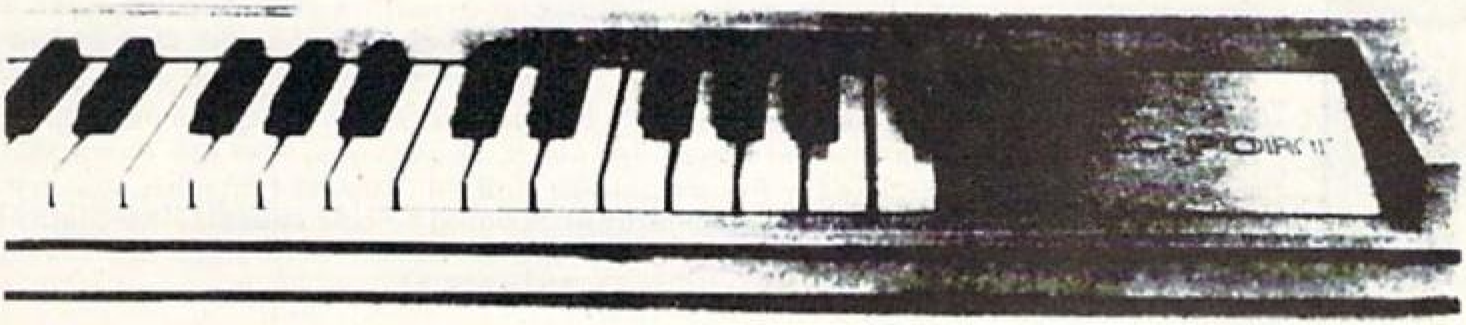

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Commodore 64

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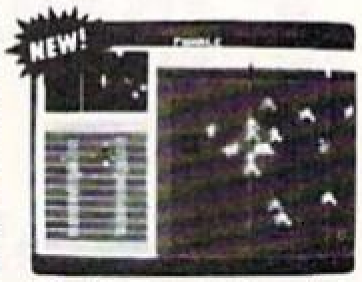
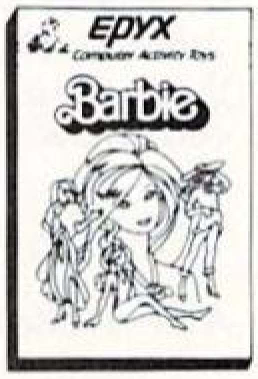
The Best Arcade Games Around

Winter Games — Experience the challenge of six winter sporting events. In the Bobsled, you're right in the tube careening along the walls. At the SkiJump, you control your form in take-off, flight and landing. In Figure Skating, timing counts for the transitions, the jumps and landings. Choreograph your own routine in Free Style Skating. Hot Dog Aerials push your agility to new heights. The Biathlon challenges your endurance in cross-country skiing. There's even an opening ceremony, complete with national anthems. One to Eight Players. (Disk) List $39.95. **Sale $22.95.**



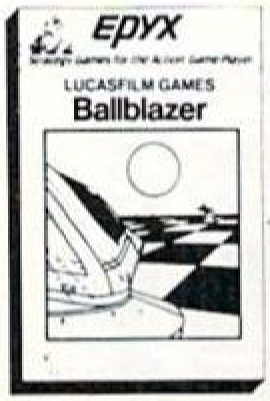
The World's Greatest Football Game — This one has it all — strategy, action, three views of the field. It's in a class all its own! Finally, a football game that not only puts you on the field, but also on the sidelines in the coach's shoes. Use the "Playbook" or design your own offensive and defensive plays. Then, grab the joystick and put your strategy to the test. You control key players to run a sweep, make a tackle, throw a pass and even kick a fieldgoal. All the action and all the strategy make this your favorite football game. (Disk) List $39.95. **Sale $22.95.**

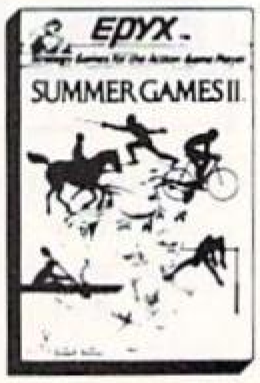
EPYX
JET COMBAT SIMULATOR



Jet Combat Simulation. Flight simulation programs are the most requested in the country. The key to a good one is realism, the sensation of being in the cockpit — guiding the plane through take-offs, landings and air to air — air to ground combat. You are an Air Force pilot and your mission is critical. Your success in completing your orders depends on how quickly and accurately you react. Very Intense — Fantastic Graphics, animation and control elements. (Disk) List $39.95. **Sale $22.95.**

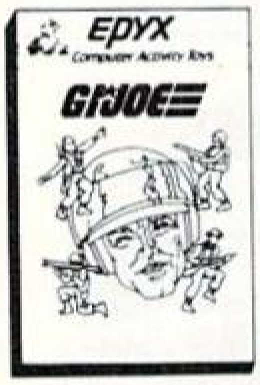
Barbie — The biggest name in dolls. Browse through Barbie's closet full of beautiful clothing and dress her for the party. You can cut her hair or make it longer and color it or change the style. Buy new clothing at the boutique or any of the six other specialty shops, or even go to the dress shop and create Barbie's designer clothes with the help of the computer. The combinations are endless and so is the fun. One or two players. (Disk) List $39.95. **Sale $24.95.**

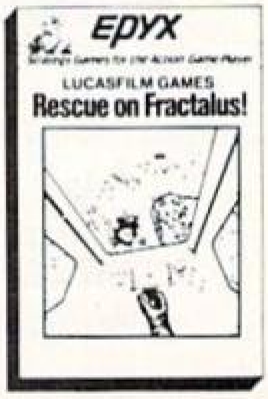




Ballblazer — Unique split-screen, 3-D graphics give you and your opponent a first person view of the field of play. You race across the playfield in your Rotofoil trying to capture the ball and fire it through the goal before your opponent. The winner is the player with the most points at the end of the timed competition. Hold onto your joystick and keep that finger on the fire button, this is the type of two player head-to-head action you've been waiting for. Two Players. (Disk) List $29.95. **Sale $24.95.**

Summer Games II — The original Summer Games was last Summer's No. 1 seller. Carry on the tradition with another chance to "Go for the Gold!" Introducing Summer Games II with 8 new Olympic events including Kayaking, cycling, fencing, diving, track & field, gymnastics and equastrian. The excitement of Olympic competion is present in this new version as it was in the original. Great graphics and sound effects. This one's a winner! (1 to 8 players). (Disk) List $39.95. **Sale $24.95.**





G.I. Joe — The best selling toy soldier is now available as an activity toy on the home computer. Select the battle situation then choose the equipment you think you will need to get the job done. Choose from a number of uniforms and weapons in your well stock arsenal and get ready for the action. Play alone or with a friend, if you plan the right strategy you will complete the mission if not you will have to try again. One or two players. (Disk) List $39.95. **Sale $24.95.**

Rescue On Fractalus! — Your mission is to fly your Valkyrie Fighter through the Jaggi defenses and rescue the downed Ethercorps pilots. Sounds easy, but don't let it fool you. It's tough enough just to navigate the mountains and canyons of Fractalus, but try doing it while destroying enemy gun emplacements or dodging suicide saucers. We supply the Long Range Scanner, Dirac Mirror Shield and Anti-Matter Bubble Torpedoes ... YOU supply the skill and guts! One Player. (Disk) List $29.95. **Sale $24.95.**

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XEROX Educational Programs

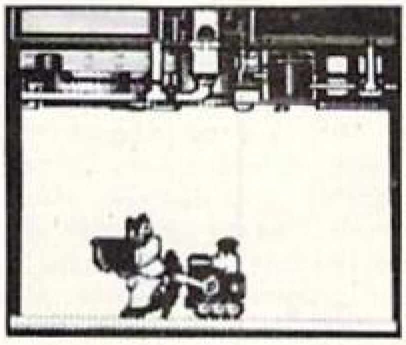
Stickybear Bop

Rack up points by bopping all kinds of objects — planets, stars, ducks, and more... First, you'll flip balls at an animated shooting gallery of whizzing targets that appear. Bop as many as you can. Bop more, score more!... To pile up points in succeeding rounds, you must bop the assorted objects Mr. and Mrs. Stickybear are juggling...don't get bopped by the sandbags Stickybear drops when he sails across the top of the screen in his balloon... and watch out for a pair of silly birds who will try to steal the little balls you need to play with. The game continues with more shooting galleries, sandbags, a bigger flock of silly birds, and more of everything to be bopped. (Disk) List $34.95. **Sale $24.95.**

Stickybear Numbers

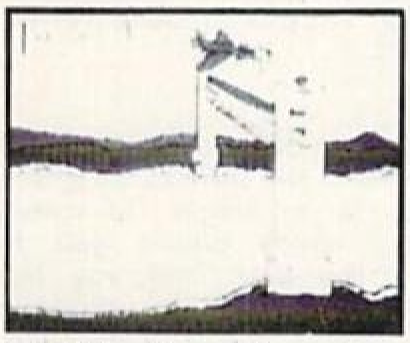
There are colorful groups of big moving objects, such as ducks, birds and bears, that reinforce numbers and counting skills. You can use the space bar to learn to count up and down. The many possible picture combinations work to captivate youngsters with an endless variety of picture shows and give them plenty of hands on computer experience. (32 page book, disk, colorful Stickybear poster, Stickybear stickers.) (Disk) List $34.95. **Sale $24.95.**

Stickybear Basketbounce



Your goal is to win as many points as you can by catching colorful, bouncing, falling objects — including bricks, donuts, and stars — before running out of baskets. While trying to accumulate points, Stickybear must duck falling objects and dodge moving ground obstacles that try to trip you. Keep score on the computer to see which player's on top.

New obstacles and falling objects in each successive round require more and more skill in order to score. The rounds increase in difficulty as you progress through each level, making Stickybear Basketbounce a game that is fun and challenging for all ages. (Disk) List $34.95. **Sale $24.95.**



Stickybear Opposites *Award Winner!*

Stickybear floats across the screen on unicycles, in cars, on hot air balloons and other delightful vehicles to teach beginners about opposites and build reasoning skills.

Such concepts as up/down, full/empty, in front/behind and more soon become crystal clear as Stickybear does his stuff with fun activities and eye-popping animation. A colorful book and a poster provide additional opposites for 3- to 6-year-olds to learn. (Disk) List $34.95. **Sale $24.95.**

Outstanding Software Award — Preschool Education — Creative Computing.

Stickybear ABC *Award Winner!*

Beautifully animated pictures help children learn their ABC's and become familiar with computers. Two full-screen, full-color pictures with sound represent each letter in the alphabet.

Besides helping boys and girls become familiar with computers, Stickybear ABC teaches younger children to recognize and name the letters. Older children begin to recognize words on sight. (Disk) List $34.95. **Sale $24.95.**

Best Software of the Year — Learning Magazine Parents' Choice Award — Parents' Choice.

Stickybear Shapes

Three delightful, full-color games help 3- to 6-year-olds identify circles, squares, triangles, rectangles and diamonds. When the youngster makes a correct choice, a big, bright picture comes alive with colorful animation! Even older children who have already learned these shapes will enjoy experimenting with Stickybear Shapes!

A special book and poster that accompany the disk provide additional activities for building shapes recognition, an essential school skill. (Disk) List $34.95. **Sale $24.95.**

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YOUR OWN PROGRAM
FileWriter

YOUR OWN PROGRAM
ReportWriter

ReportWriter — Lets you make 'data' into information that can be reorganized and presented to help you make decisions. You need invoices turned into commission reports, customer leads tuned into mailing labels, accounts receivable turned into letters to your customers. ReportWriter can handle all of these requests. You create your own report ideas with ReportWriter. A report can be simple columns of figures, a memo, a check, a label, whatever you need. You may create as many reports as you like from the same files; it will report to the computer screen or to your printer. (Disk) List $39.95. **Sale $29.95.** *Coupon $24.95.*

MenuWriter — MenuWriter links programs together so the user can select the program he needs by pressing just one key. Where good program design calls for several different files or reports to load smoothly and quickly, MenuWriter does the job. You set up screen after screen (up to 21) of simple clear menu formats to link your programs together. Menus can call programs to auto-load or simply call other menus. You control the whole process -from color selection to screen layout, to key choice. Whether you're working with CodeWriter programs or your own, MenuWriter will give you professional menu results the first time. (Disk) List $39.95. **Sale $29.95.** *Coupon $24.95.*

YOUR OWN MENU PROGRAM
MenuWriter

SPEED UP YOUR OWN PROGRAM
Speed Writer

SpeedWriter — What do you do with a BASIC program that you wrote (or bought, or typed) that is nice, does what you wanted it to do, but is just too slow to suit your needs? SpeedWriter makes BASIC FLY! A must for the sophisticated programmer, yet easy enough for the novice. Reduces program size up to 50%, in addition to speeding up your program to run 10-30 times faster. Couldn't be simpler! (Disk) List $49.95. **Sale $39.95.** *Coupon $34.95.*

AdventureWriter — You think playing computer adventure games is exciting? How about the thrill of creating your own? It's all in this package. Your own heroes and villians, monsters and magicians, castles and coffins. You create complete adventure games without programming, which run on your disks. As many adventures as you can dream up - your treasures, your own fiendish riddles, and your treacherous plots for your friends to figure out! You control locations, treasures, hazards, characters, all descriptions and the plot. Computer adventures are one of the fastest growing hobbies around. Send them in for evaluation, we could market them for you. * graphics included in Commodore. **Com-64 Version** (Disk) List $49.95. **Sale $39.95.** *Coupon $34.95.* **Atari Version** (Disk) List $39.95. **Sale $29.95.**

Adventure Writer
The ELF System
Dialog

Dialog — You can create all the EDUCATIONAL programs you can imagine without programming with the DIALOG program. Dialog is a simple on-screen process which allows you to create the first time you try, programs to educate children, inform adults, or just to entertain. Everything from simple tests to training manuals to complete novels. You control all the text, questions and answers. Any presentation is made more alive with the human give and take of real questions and answers. The Dialog system writes all the computer code onto your disk -to distribute any way to like. Graphics included. (Disk) List $49.95. **Sale $39.95.** *Coupon $34.95*

ELF System — Finally, a simple way to create calculation/print programs. These are NON-FILE programs which let you: (A) Collect information; (B) Number crunch with all the conditional calculations you need; (C) Display the results to the screen or printer any way you'd like. It's like a spreadsheet without rows and columns an a super calculating word processor without the hassle. (Disk) List $39.95. **Sale $29.95.** *Coupon $24.95.*

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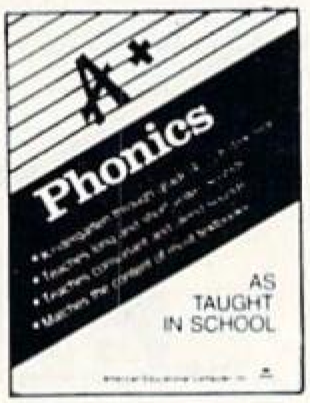
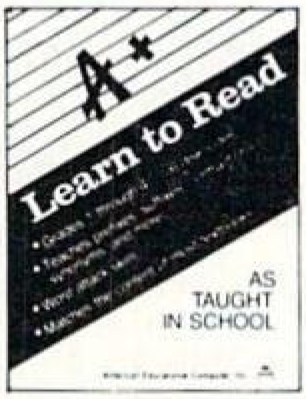
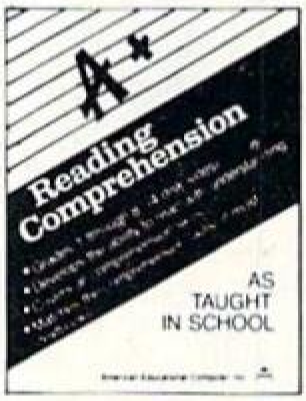
All programs were written by teachers and have been classroom validated. These programs teach in a standard classroom format with rewards as the user gets through the various lessons.

Atari & Commodore 64
EasyReader Series

There are three programs in this series designed and tested by teachers from the appropriate grade levels for accurate content. Each disk keeps track of the students name, ensuring that the user completes one lesson before starting a new one. Animation, Graphics and sound are used in a successful way that keeps the child's interest as he learns each new skill. Correct answers are rewarded and wrong answers are corrected. Very easy to use, with most instructions appearing on the screen when needed.





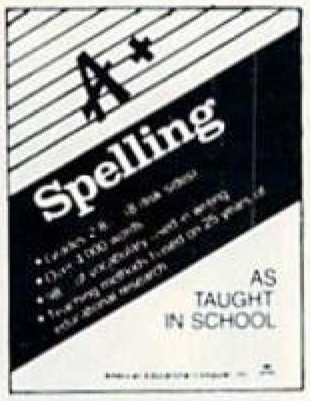


Phonics. A program designed to teach beginning phonics: the sound of vowels and consonants. Helps child to develop skills for successful reading. The material covered follows the same guidelines of most textbooks. 8 disk sides; for Kindergarten through grade 4. (Disk)
List $39.95. **Sale $24.95.**

Learn To Read. Provides work with structural word skills — contractions, prefixes, suffixes, synonyms and more. Prepares child for material that will be covered in the classroom as well as building on traditional school curriculum. Grades 1-4. (Disk) List $39.95. **Sale $24.95.**

Reading Comprehension. Helps child to develop reading skills with an accent on understanding the material presented. Teaches cause and effect, similarities and differences, predicting outcomes, main ideas and more. Grades 1-8. (Disk)
List $39.95. **Sale $24.95.**

Atari & Commodore 64



(Disk)

AEC Spelling — A series of seven educational software programs for grades 2 through 8. It teaches the spelling of 4,000 words most commonly used in writing (98% of most people's writing vocabulary). The word lists used are the result of over 25 years of research into the writing/spelling needs of children and adults. Each grade level consists of one two-sided disk with word lists on one side and study activities on the other. The activities are designed to develop mastery in spelling utilizing a Test/Teach/Test approach. A pre-test is used to find out which words a user cannot spell correctly. These are recorded on a "Words To Study" list. The activities for learning these words are provided. Finally, a post-test is taken by the learner to measure progress. The approach is simple and rewards are built in. (Grades 1-8) List $39.95. **Special Sale — 8 programs/4 disks $24.95.**

spelling
grade
American Educational Computer

(Disk)

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SEGA

Commodore 64

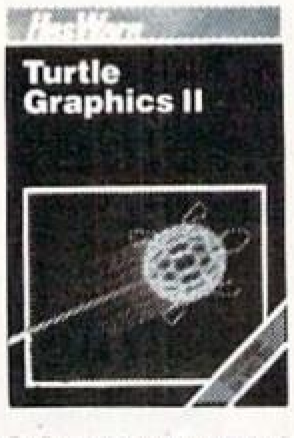
Super Zaxxon — Use the skills and tactics you learned in Zaxxon to master the new patterns and dangers in Super Zaxxon. Floating foretresses but with deadlier weapons and tighter passageways. 3-dimensional perspective but with even more realistic graphics. 3-dimensional flight but with a perilous tunnel requiring even more precise control. And a fire-breathing dragon that makes Zaxxon's robot look like a wimp. (Disk) List $29.95. **Early Christmas Sale $9.95.**

Early

Type'N'Write
Type'N'Write

Typing Tutor — Give your children an education they'll never get in school. Just think how much a child could learn if they had their very own private teacher at home. That kind of specialized help is now available through educational software programs from HesWare. There's Type 'N' Write, for the Commodore 64, that introduces your children to keyboard skills. Touch typing. And even word processing, for creating and editing up to eight pages. (Disk) List $29.95. **Early Christmas Sale $9.95.**

Christmas



Turtle Graphics II (LOGO) — An exciting and fun way to discover computer programming concepts. Turtle Graphics II is an easy-to-learn computer language that enables the beginning programmer to master the computer in just a few minutes. By telling an imaginary turtle how to roam about on the screen, the Turtle Graphics II programmer can create colorful and artistic pictures. As one becomes more and more adept at teaching the turtle to paint, he or she is painlessly learning all of the basics of computer programming. This not only develops computer awareness but enriches one's math, logic, communication and artistic skills as well. List $29.95. **Early Christmas Sale $9.95.**

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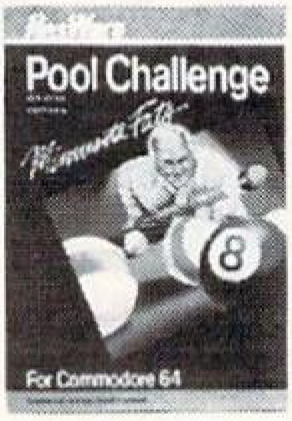

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Now you can play pool on your Commodore-64. Sharpen your aiming accuracy and shooting finesse. Using only a joystick and a few keystrokes you choose where to aim and how much power to use. Fantastic action. (Cartridge). List $29.95. **Early Christmas Sale $9.95.**

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STRATEGIC SIMULATIONS INC.

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It's An Experience

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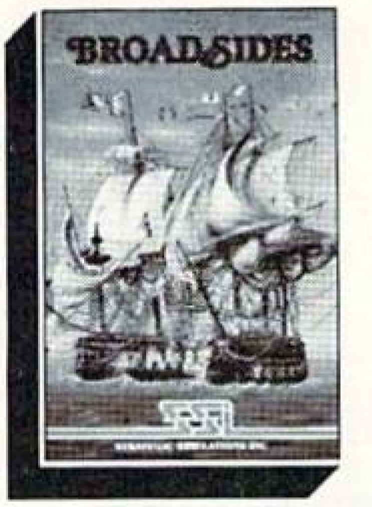
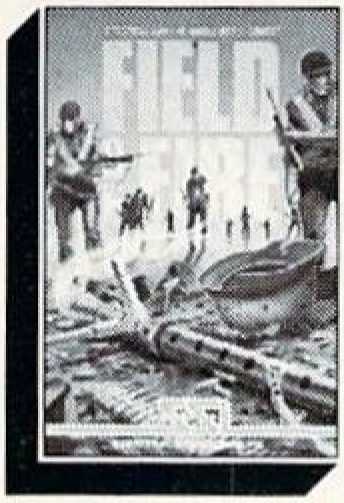
Broadsides — A tactical simulation of ship-to-ship combat between sailing ships of the Napoleonic era. You will match yourself against another ship commanded by the computer or by a human opponent. To be victorious you may use various types of ammunition for your cannons, or you may attempt to board the other ship and engage in close combat using swords and muskets. (Disk)
List $39.95. **Sale $24.95.**



Computer Quarterback — This game offers true realism in a very playable format! Two players compete by selecting plays and then watching the animated action of their teams clash on the gridiron. The use of the game paddles allows each team to enter their plays in secret (as if in their respective huddles) until the offense "hikes" the ball. Fantastic Action. (Disk)
List $39.95. **Sale $24.95.**

COMPUTER
QUARTERBACK

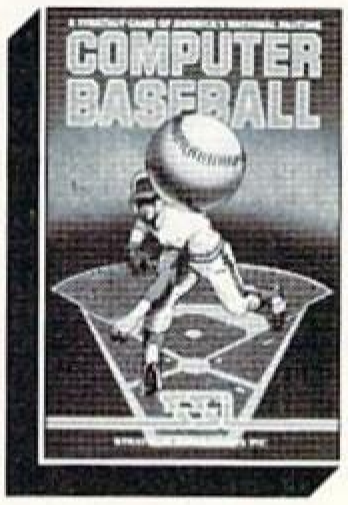


Field of Fire — World War II combat that allows you to direct fire, order assault and movement of fireteams on a scrolling hi-res. screen. Lead Easy Company of the First Infantry Division through eight historical battles in North Africa and Europe. (Disk).
List $39.95. **Sale $23.95.**

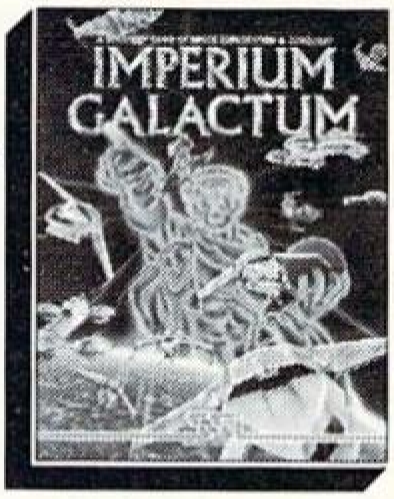
COMPUTER
AMBUSH

Computer Ambush — A simulation of squad versus squad (man to man) combat in France during World War II. Uncertainty factors are applied to all movement to create a realism unsurpassed by other wargames. By playing the game many times, you will begin to get a feel for what to expect, but you will never know for sure. Thus, we have here a game that truly creates the "fog or war". Fantastic Realism. (Disk) List $59.95. **Sale $39.95.**

Computer Baseball — Allows you to manage some of baseball's greatest teams, and make key managerial decisions yourself. Manipulate pinch hitters, infield positions, relief pitchers and base runners, trying to obtain that small statistical edge which can mean the difference between victory and defeat. (Disk)
List $39.95. **Sale $24.95.**



Imperium Galactum — You design your own legion of starships ranging from explorers to battleships. Your goal is to conquer a universe, a planet at a time, either by negotiating an alliance or in combat. Fantastic Graphics and Realistic Combat make this a must for everyone. (Disk). List $39.95. **Sale $26.95**



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REVIEWED BY GARY FIELDS

Crusade in Europe

Computer: Commodore 64
Publisher: MicroProse
120 Lakefront Drive
Hunt Valley, MD 21030
Medium: Disk
Price: $39.95

Crusade in Europe is World War II. MicroProse just compressed it so it would fit inside a Commodore 64. Two years ago, a game of this complexity, historical accuracy, and ease of play would have only been a war gamer's dream. Sid Meier and Ed Bever of MicroProse Software had the same dream, and made it come true.

When I think of strategy games, I usually visualize a battle, played thoughtfully and slow. One player moves, then the opponent, each side taking turns. That's fine for a game, but in battle no one waits for a commander to consider all his options. To win, he must be fast on his feet or suffer the consequences.

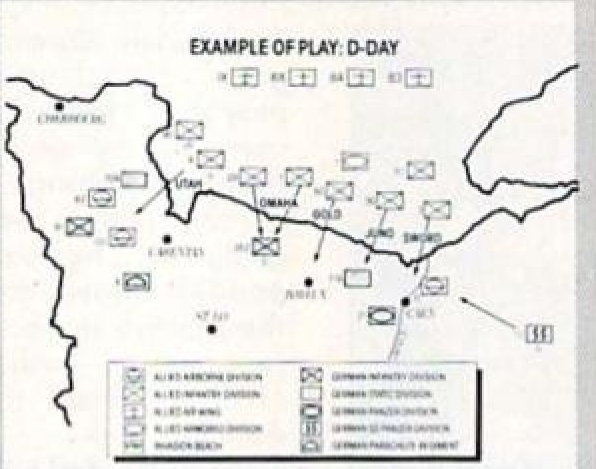
Crusade in Europe is that demanding. It has the feel of battle. Enemy tanks can punch holes in your carefully drawn battle lines, supply lines can be cut, and air strikes can pound and paralyze your counter attack. Outnumbered troops can even lay down their arms and surrender.

Crusade in Europe is true simulation. When you play, you will be reliving a World War II battle. To call this a game is like calling New York just a town. *Crusade in Europe* may look like a game, but it plays like war.

The copy-protected disk comes with a 56-page manual which includes helpful historical notes about the real battles *Crusade in Europe* simulates, and a quick reference card. There are five different scenarios to simulate and each can be played using up to five different variants. You get 14 different battle situations.

The scrolling battle screens accurately display the terrain of World War II France. Strength of the opposing armies, generals, reinforcement schedule, and air support are all historically accurate.

> *Two years ago, a game of this complexity, historical accuracy, and ease of play would have only been a war gamer's dream.*



The game begins with an animated display of General Patton addressing his troops. You are then asked to enter a password code. This procedure is actually a form of copy protection. The codes are listed in the owner's manual. If you enter an incorrect code, you are declared a spy and allowed to play only a demo game.

You then choose one of the five scenarios contained in *Crusade in Europe*: the Battle for Normandy, Race for the Rhine, Operation Market-Garden, the Battle of the Bulge, or Crusade: the Battle for France.

You must now choose one of the different variants available for the battle. The variant most importantly determines the game's length. Short battles can be fought in under an hour, while longer versions can last as long as ten hours.

You can play the battle historically or weigh the scales in favor of either the Allied or German armies. Do battle with another person or against the computer. And you can command either the Allies or Germans. In fact, you can even switch sides during play.

The ability to change sides in mid-battle is interesting. If you are being overwhelmed, you can simply go over to the winning side, or vice versa. But the most interesting use I found for this option was to obtain intelligence reports. (That sounds a little like cheating, doesn't it?) To do this, simply freeze the action by pressing "F." Then press "Q" for quit. Now take the opposing side.

The troop locations of your former enemy are now displayed, plus you can access each unit's reports and find out which are low on supplies, what their battle orders are, and combat effectiveness. When you keep bloodying your nose pounding against the same enemy unit, it helps to find out why.

The game pieces can be directed by either joystick or keyboard input. Each unit can be ordered to attack, move or defend. Pressing the space bar displays information about each unit, such as supply status, combat effectiveness, or battle orders.

Pressing the "G" key displays information about that unit's commanding general. The "T" key clears the screen so you can inspect the terrain for forests, bridges, rivers, mountains and villages.

To win, you must carefully plan attacks and pick positions to defend. Armored troops fight better in open terrain, while infantry do better in towns or forest. The game even allows air support and paratrooper drops.

Action is not divided into traditional turns. The action is continuous, and only stops when the "F" key is pressed to freeze play. A battle display can be several screens in size, so you'll need to constantly scroll to keep in touch with your troops. This means the battle development can become confusing—just as in the real battles.

I don't usually end a review without finding at least one limitation of the software. And usually that's no problem. But *Crusade in Europe* is so well designed and playable, I had to look harder. I did come up with one complaint: When reloading a saved game, there is no option to view the disk directory. If you can't remember the exact spelling, you'll be forced to dump the program, list the directory, and restart. Not a real problem, if you remember to check the save name before you start. ■

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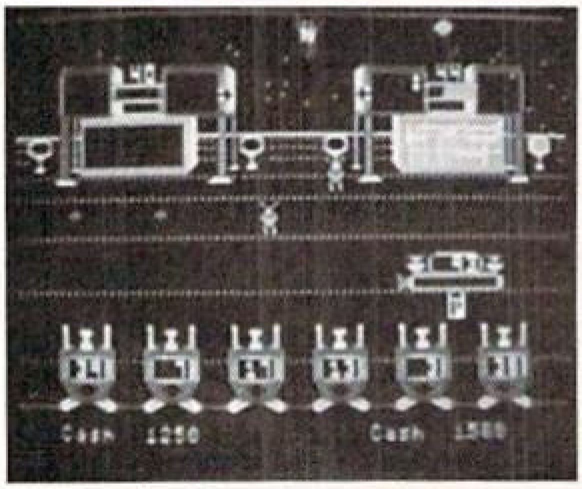
BY CHRISTINE ADAMEC

Business Made Fun for the Commodore 64

Economics and the business world, with its supply-and-demand curves and confusing concepts, can be mind-bogglers for children. But your children—and you—can learn the basics by playing these business games for the Commodore 64—games that teach you about competition, pricing, profits, and losses.



Run for the Money
Scarborough
55 N. Broadway
Tarrytown, NY 10591

Run for the Money uses an arcade-style format to reach children ages ten and up. First, familiarize yourself with the mission: you must paint your spaceship and take off.

You and one other "Bizling" have landed on the planet Simian to repair your damaged spaceship shields. (The other Bizling is either the computer or another player.) The fix of your spaceship requires a repainting. So what has this got to do with economics? Well, you Bizlings are broke and must earn money to buy paint and get those ships launched. The first Bizling to blast off wins the game.

Except Simian is full of hungry Simians salivating for synanas (synthetic bananas). The Bizlings can make synanas by buying "rufs" from the mysterious underground Ruffians ("ruf" is raw material). Then they can manufacture the synanas in their spaceships. The Bizlings make and sell the synanas to the Simians at a profit, then bid for and buy the paint from Hyam Mighty, the guy who owns the paint store.

Learn the basics of business by playing these business games for the Commodore 64.

There are a myriad of strategies. The very clear and well illustrated manual provides 12, from the Burger Strategy to the Save and Splurge Strategy. For example, let's go for the "instant gratification" strategy, which I devised on my own. I went for a high mark-up, high-advertising plan to get rich quick.

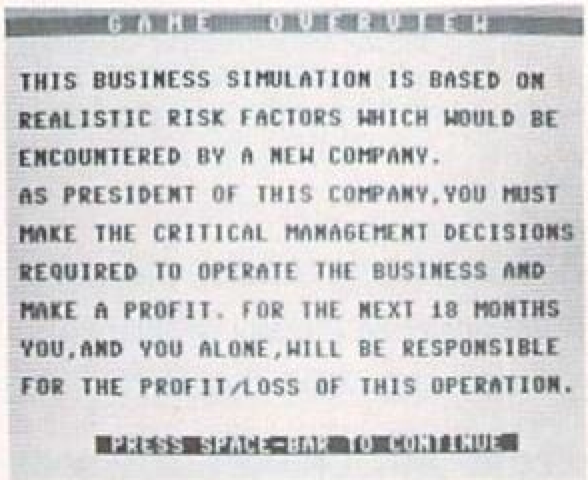
I went to the ruf-houses with the lowest-priced rufs, bargained with the Ruffians to get the price down, and marked up the finished synanas as high as I dared. Then I bombarded my Simian consumers with an advertising blitz, complete with a Bizling flashing a synana. This strategy worked great for several turns, but then the weekly Simian Survey evaluated my quality as only "fair," and my sales began to plunge.

In the meantime, my competitor, who was using medium quality and higher-priced rufs to make his synanas, forged ahead of me. Hmm, better change my tactics next time if I play this competitor again.

The game has three levels of difficulty, ranging from beginner to tycoon. More options and business opportunities are provided at the higher levels, plus more advanced production machinery. You can also invest in land and gold. The program follows the same laws of supply and demand, with a little randomness thrown in to simulate the real world. Also included is a "what if" machine, which is a miniature spreadsheet to help you set prices and determine potential production quantities and advertising budgets. There's plenty of fast action on your joystick, or you can opt to use your keyboard to play.

Any criticism? Well, at the higher levels where you can invest in gold and silver, you may find yourself in a dilemma. To win the game, you must take off before your opponent. But if you're raking in the big bucks through your farsighted investments, maybe you're not so excited about painting the spaceship and departing. So in this case, you might "lose," but at least you'll be rich!

Run for the Money is a very entertaining program as well as a super learning tool. The graphics are good, and the fast-paced action will keep your child's attention as he or she learns about the business world.



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G A M E   O V E R V I E W

THIS BUSINESS SIMULATION IS BASED ON
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MAKE THE CRITICAL MANAGEMENT DECISIONS
REQUIRED TO OPERATE THE BUSINESS AND
MAKE A PROFIT. FOR THE NEXT 18 MONTHS
YOU,AND YOU ALONE,WILL BE RESPONSIBLE
FOR THE PROFIT/LOSS OF THIS OPERATION.

PRESS SPACE-BAR TO CONTINUE
```

Management Decision
Infinity Software
536 Curie Drive
San Jose, CA 95123

Management Decision is a serious game, for those who aren't won over by the arcade-style scenario of *Run for the Money*. This game is probably best for high school age and up.

In *Management Decision*, you're the president of the company for 18 months. You first see a choice of three screen options. You start with the Presidential Decisions screen, where you decide how many units to make and set your price.

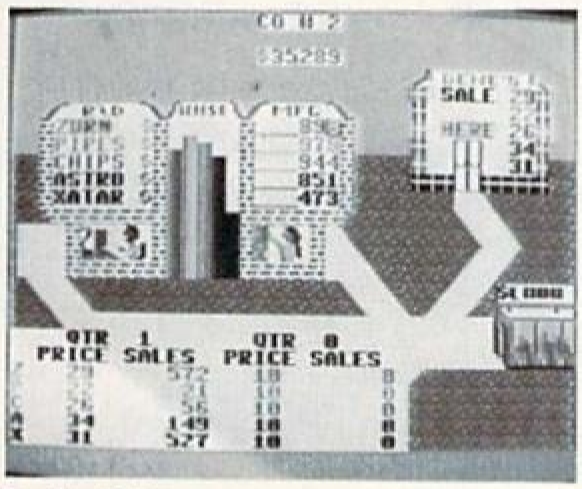
From there, you move to the Operating Expenses screen, which tells you how much "working capital" (otherwise known as cash) you have, cost of raw material, overhead, and other data. You can increase production, buy a robot for $2,000, advertise, or invest in some research and development. You can manufacture up to three products, or develop a new one.

At some point in the game, you may find yourself in the red, showing a negative working-capital balance. The computer offers you the option of taking out a loan or cutting production. I strongly recommend you go for the loan. I had a balance of $380 and decided to reduce production from fifty units to one unit. Even though I made less products, my working capital plunged down to -$2,240.40! Apparently I was penalized for the month I reduced production, and I ended up taking the loan anyway.

After you're satisfied with your financial choices, press the asterisk and RETURN, and exit the screen. This leads you to production and a little graphics of your product as it's manufactured in the factory. Now you'll move on to the sales analysis graph, which reveals sales for the past six months on each product. Then you can opt for the production and inventory screen, which is basically a staff meeting: Your accountant says that you should push up profits, your marketing manager wants to advertise more, and your sales staff tells you what competitors are charging.

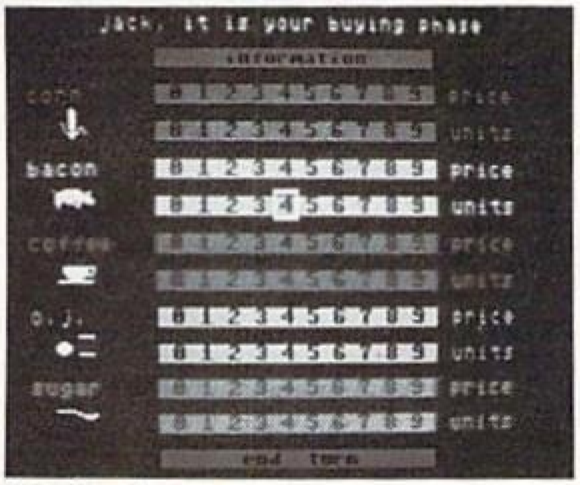
The program even throws in some real-world crises. For example, my employees once went on strike, which cost me $2,000. And you've got to keep on top of what your competitors are charging, because they may increase or slash their prices, which will affect your sales. Watch your inventory levels, and make sure you don't over- or under-produce.

Management Decision is a challenging program which requires you to exercise those old brain cells, while at the same time teaching you about the world of business.



In the Chips
Creative Software
960 Hamlin Court
Sunnyvale, CA 94089

Your goal for *In the Chips* is to manufacture, advertise and sell computer programs. You can make up to five programs. The graphics are simple but cute, and you always get a visual representation of where you're at in the process. At the end of each cycle, you get a financial statement showing where you and your competitor stand. It's a challenging game, and one that's very addicting. For an in-depth review, see the December/January 1984-85 *Power/Play*.



Market Forces
Intelligence Quest
4517 Harford Road
Baltimore, MD 21214

Maybe you see yourself playing with the commodities market: investing and selling corn, bacon, coffee, or sugar. If so, try *Market Forces* from Intelligence Quest Software.

This game is challenging and fun, and the more competitors, the more exciting the game. (You can play by yourself or with up to nine competitors. You do need a joystick.)

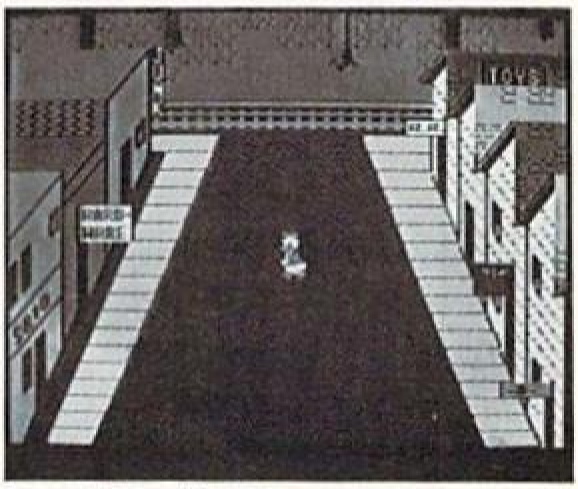
The game lasts six game years. You start off buying the commodities you think will sell the best. Set your buying price with your joystick. It doesn't register on-screen so you can keep it a secret from the competition.

You can pay up to nine dollars and buy up to nine units—but you won't always get exactly what you request. The game is influenced by what your competitor buys and pays, and what the seller is willing to accept.

During the selling phase, you set the price. You aren't permitted to build up your inventory, and you must sell every single item, because any unsold items are lost forever.

You periodically get messages from the "experts," who'll say, for example, "Top market analysts believe corn will soon be in demand." Of course, they may be wrong, and *are* wrong about 15% of the time.

You can go bankrupt if you buy more than you can pay for. So if you're worried about how much cash is left, move to the information screen, and hold down the joystick button to find out where you stand. The information mode is also good because it tells you what commodities are hot at the moment. I recommend this game for high school-aged children.



Donald Duck's Playground
Sierra
Sierra On-Line Bldg.
Coarsegold, CA 93614

Donald Duck's Playground is a charming program for your children ages seven through eleven. Donald must "work" for his money at the airport, train station, toy store, or the produce market. Then he can buy items at the junk store and hardware store to place in the playground.

The game promotes the old work ethic as well as providing a fun way for children to learn how to make change—when they want to buy an item, they must select the appropriate coins to pay the cashier.

The graphics of this game are impressive, as is the sound. And the attention to detail is super. For example, before Donald crosses the street to go to the playground, he carefully looks both ways. This program is "action-packed," as the well-documented manual says. A good value for parents and educators alike. For an in-depth review, see the July/August 1985 *Commodore Microcomputers*.

If your children master any of these business simulations, I can't promise they'll develop an overwhelming urge to read the Wall Street Journal or a compulsion to wear three-piece suits. But they will have a much better handle on the basics of business and economics, and how our system works. And that's the real bottom line. C

D-Compiler $59.95

The first D-Compiler to give you back your source code *after* your program has been compiled with **Blitz.*

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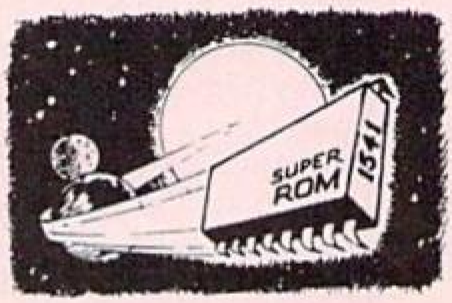

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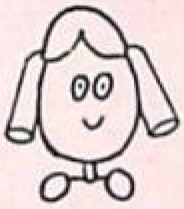

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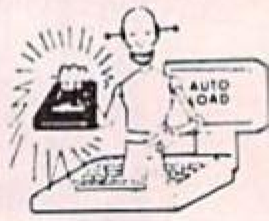

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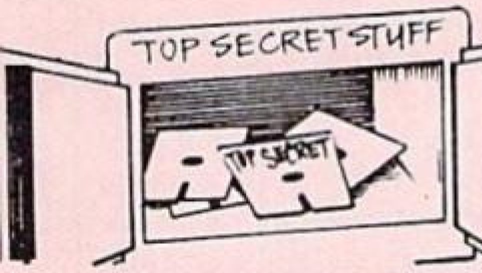

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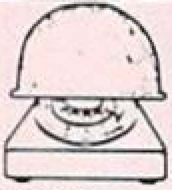
WAR GAMES AUTODIALER



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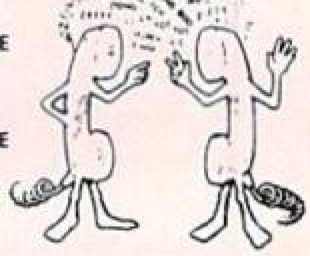

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2-CREATE MEGA FILES
3-ADD TO SYSOP'S CORNER
4-NEW SYSOP'S CORNER
5-READ MESSAGES
6-SCRATCH MESSAGE
7-CYCLE MESSAGES
8-READ SYSOP MESSAGES
9—WRITE OPENING MESSAGE
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REVIEWED BY MARK COTONE

Mail Order Monsters

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Publisher: Electronic Arts
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San Mateo, CA 94403
Medium: Disk
Price: $29.99

> *Not since King Kong took on Godzilla has there been such a ferocious creature feature with so many strategic possibilities.*

Monsters are nothing new to computers. They've invaded from the heavens in countless shoot-em-ups, crawled along hallways in a multitude of mazes, and attacked from within text in all shapes and sizes. This group of unknown origin almost always outnumber, and ultimately outlast, our doomed on-screen heroes.

It's about time we met these deadly antagonists on equal ground, and with Electronic Arts' *Mail Order Monsters*, the time is now. Here is a chance to lease and outfit a surrogate creature who will actually go to video war for *you*. Here is a customized beast of your very own.

To initiate players to this game's structure and format, the contest is divided into three levels which increase in difficulty and strategic depth.

The beginner stage, called "Free Trail," familiarizes you with movement and attack. First, with a decision that will certainly reveal some hidden aspects of your alter ego, you choose the monster, otherwise known as morph (mail order psychon hero), that will represent you in combat. The vats have a dozen stock models to choose from, ranging from the prehistoric-style Tyro, Bronto, and Pterasaur, to such imaginative mixes as the Lyonbear, a self-descriptive hybrid, and the Carnifern, a mobile plant with a meaty appetite. Each morph has inbred attributes and vulnerabilities of strength, speed and brains, so the lot remains fairly balanced. After you and your opponent find your favorites, you simply give them names and it's off to the battlefield.

The action is portrayed on two separate screens. The first is an overview of a large map, where your surrogate is a small joystick-controlled cursor. When two enemy cursors meet, the scene switches to a detailed depiction of the two combatants.

It's like some fictive animalistic boxing exhibition, or, better still, a paleolithic professional wrestling match. Animated larger-than-life beasts circle each other on a surrealistic canvas, lunging, groping, and searching for openings. The player who can combine quick joystick jabs with the accurate use of the landscape for hit-and-run raids finds the most success at this stage.

The intermediate, or "Rental" level, adds to the challenge by testing your hand at investing. Working with 500 monetary units called psychons, you must now pay for the use of a morph. The same assortment of creatures is displayed, but now each has a price tag. And for an additional sum, you might consider strengthening your morph by developing him or arming him with some exotic, state-of-the-art firearms. Weapons include the needler, laspistol, and gas gun, all of which require ammunition to be purchased separately. Believe me, it won't take long to deplete your allowance.

You must make some additional strategic choices before the battle begins. One player selects the terrain, usually opting for a battleground which will hamper his opponent's mobility, while the other player chooses from among three contests.

The first, entitled "Destruction," is the same head-to-head game played at the beginner phase. The second, "Capture the Flag," sends both participants on a hunt for a series of eight flags while avoiding the banner's menacing guards.

The third, and finest, contest is called "The Horde." Here, you and your fellow player must work together to stop a swarm of assailants who are racing toward the screen's bottom. This contest shines brightest because it rewards aggressiveness directly: The winner is the one who annihilates the most hordlings. The previous contests include some roaming warriors and urban assault tanks that try to coax combat from the passive participant, but this contest force-feeds the fights.

The advanced "Tournament" level game provides an even stiffer challenge. Your psychon ration has now been cut to 250, so your morph won't have the initial firepower to which it is accustomed. And each player is also allowed to place further restrictions on the other by selecting special inhibiting rules from an accompanying list. The narrow-minded morph will stand little chance of survival, since his one-pronged offense might be rendered impotent.

No doubt the going will get rough, but a well rounded combatant will be justly rewarded. A conquest in tournament play will not only earn additional psychons and victory points that can be spent on weapons and trait improvements, but the surviving monster's status, including enrichments, can be saved to disk for future battles. If you can string together a few successive victories, you will have a mighty formidable morph.

Mail Order Monsters has simple menu-driven options, fast pace, and crisp, lively graphics which grab the attention of all ages. This program really shines when mastered by a player who understands the intricate tactical moves and has financial adroitness and quick reflexes. Not since King Kong took on Godzilla has there been such a ferocious creature feature with so many strategic possibilities. It's the kind of action that will keep you begging for morph. ■

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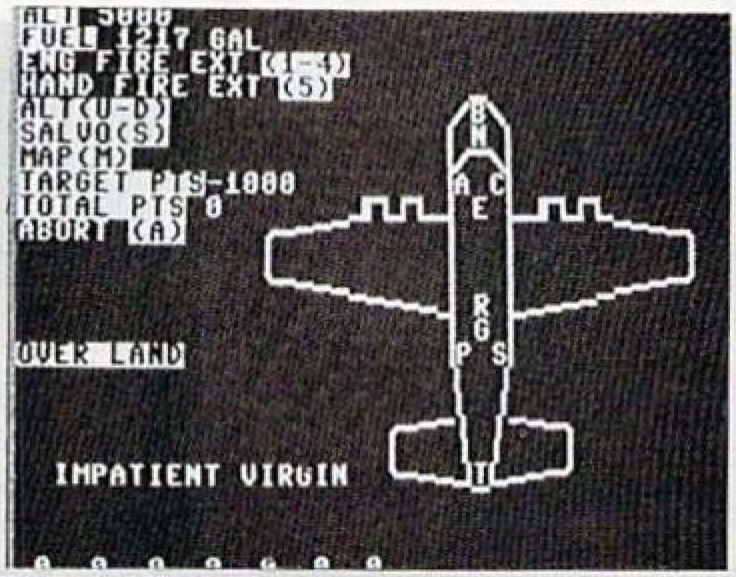
REVIEWED BY CHERYL PETERSON

50 Mission Crush

Computer: Commodore 64
Publisher: Strategic Simulations
883 Stierlin Road
Mountain View, CA
94043
Medium: Disk
Price: $39.95

As a B-17 flying-fortress pilot, you must complete your stint with the 306th Bomb Group.



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ENG FIRE EXT (1-4)
HAND FIRE EXT (5)
ALT(U-D)
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MAP(M)
TARGET PTS-1000
TOTAL PTS 0
ABORT (A)

OVER LAND

IMPATIENT VIRGIN
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In *50 Mission Crush*, you are a B-17 flying-fortress pilot. To complete your stint with the 306th Bomb Group, you have to fly (and return from) 25 missions. Since the game is called *50 Mission Crush*, you can anticipate that if you survive 25 missions, your assignment will be extended (good pilots are hard to find).

Your day starts in the briefing room at 0400 (that's four in the morning, so get to bed early). There, you and your new crew learn of the day's mission, your target and your cruising altitude. Despite your inexperience, your ten-man crew looks to you as their commander.

A map and table in the instruction booklet gives you some idea of the distances involved, and the absolute minimum fuel required to reach, bomb, and return from each target. The figure is based on flight at 5,000 feet and doesn't take into account a possible hit in the fuel tank.

In case you get the idea that this game is a romp, there are dangers. Enemy fighters will try to shoot you out of the sky and artillery batteries will take pot shots from below. You can avoid some artillery placements by taking slightly circuitous routes, but the batteries protecting your target are sure to get you unless there's cloud cover. Whether or not the damage is bad enough to knock you down depends a lot on altitude and luck. Although cloud cover below you protects your plane, it also prevents your bombadier from seeing the target.

You aren't, however, completely helpless against the fighters. A B-17 has a number of guns to shoot back with. When enemy fighters approach, your crew fires at the intruders. A little strategy can go a long way here, since your more experienced members are more likely to hit the target. On the other hand, experience shouldn't outweigh position if a younger crew member is a better shot. And remember to keep in mind that the ammunition supply is limited.

The scoring for the game is fairly simple. Dropping the bombs on the target wins points. These points are determined by the size of the bomb load, the amount and type of damage to your plane, the altitude from which the bombs are dropped, and the experience of your bombadier. If you should choose to bomb a site other than the one assigned, you won't get as many points.

Shooting down enemy fighters gets you a bonus of 250 points each. Mission points are given when you return to base. These are based on your ability to carry out orders, the condition of your crew on return to base, and the mission's difficulty. Should you accumulate enough points during a mission, you receive a medal. Being wounded in action gets you a purple heart. Accumulation of points also increases your rank.

If you can't see the target because of cloud cover, should you fly below the clouds and risk the extra flak from the artillery, or wait a while and see if the weather clears? If you wait, the enemy fighters can zero in on your position and might prevent you from dropping the bombs by disabling the bay doors.

If you abort the mission, you give up the right to fly in formation with the other bombers. A lone plane without escort makes a great target for enemy fighters. Do you have enough fuel to get back? Can you risk running out of fuel and having to ditch in the ocean? If you can't make it back, should you ditch or try to land in enemy territory?

Your mission may sustain various kinds of damage, from losing the radio to having crew members wounded. Some can be fatal, others are just minor inconveniences. But each one narrows your options farther down the line.

Not being a veteran of World War II, I can't give you an "I was there, I should know" accuracy evaluation. As an Air Force brat who sat through just about every World War II flying movie ever made (including the ones with John Wayne), I can say that there does seem to be some "truth" to this game. It certainly isn't an easy game to win.

There are no great arcade scenes, but the map graphics (though low resolution) are adequate. Also, the screen display while flying over artillery batteries is slow and mind-wracking. But the author has succeeded in portraying the suspense. For example, waiting to be hit by the bombs exploding around you is really tough on your nerves.

The documentation for the game is excellent. Besides the instructions, there is a nine-page commentary that adds color and depth to the game. As a means of understanding recent history, this package is a lot more interesting than a high school teacher. As a simulation game, requiring calculated decisions and a certain amount of guts, it is outstanding. For arcade freaks who demand games requiring a quick eye and fast reflexes, this is a "no." For crafty strategists, though, this is a definite "yes." C

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REVIEWED BY JEFF SEIKEN

Panzers East!

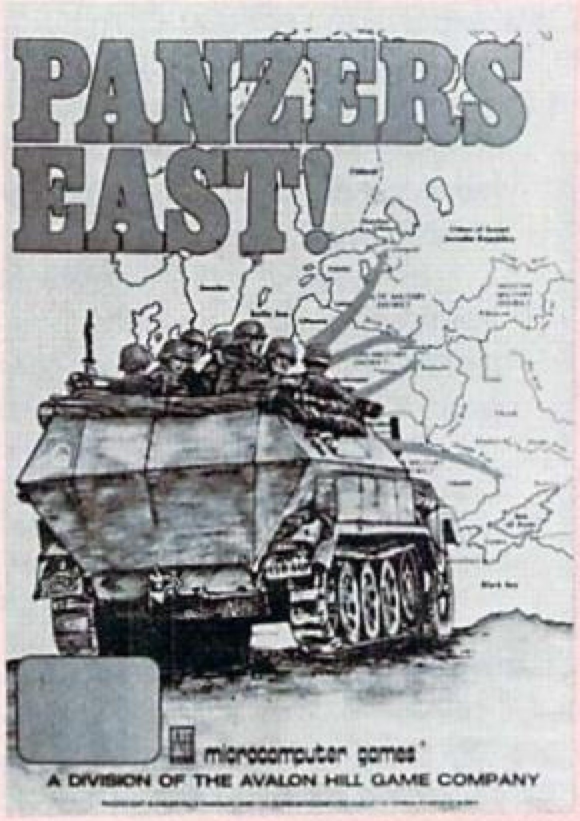
Computer: Commodore 64
Publisher: Avalon-Hill
Microcomputer Games
4517 Harford Road
Baltimore, MD 21214
Medium: Disk
Price: $30.00

On June 22, 1941, three million German troops, supported by thousands of tanks, guns, and planes, attacked along a front stretching from the Baltic to the Black Sea. Within weeks, Russian resistance had been crushed along the frontier, and the German spearheads were driving toward Moscow. By December 1, German forces had closed to within 25 miles of the Soviet capital. But in the 40 degree weather, they could get no further, and the great offensive that had begun more than five months before ground to a halt.

Panzers East! recreates these first 24 weeks of the German invasion of Russia. The game pits the player-controlled German juggernaut against the computer-directed Soviet Army. The campaign is waged across a high-resolution area map of Eastern Europe and the Soviet Union (also reproduced on the player aid card), which is divided into three regions and thirty areas. The opposing armies are represented by infantry and points. A full-strength German infantry division equals about three points.

Each turn covers a week of fighting. The player directs his forces using the keyboard, typing in move, battle, and other commands with simple two-letter codes. Infantry and points can move normally between controlled areas, but must launch assaults to enter uncontrolled ones.

> Panzers East! *recreates the first 24 weeks of the German invasion of Russia during World War II.*



Oddly, once troops enter a contested area, they cannot leave until control of the area is gained, although the player may have the option to withdraw from the area if the Russians counterattack. In strictly logical terms, this does not seem right—surely if troops possess the capability to retreat in the face of an attack, they should have the same capability to withdraw unopposed. In game terms, though, this restriction is beneficial. Since strength points committed to battle may not be shifted elsewhere until the area has been cleared of Russians, plan your assaults with great care.

In addition to the German ground troops, the player also directs the Luftwaffe (air force), likewise represented by points. Fighter strength points can patrol areas, escort bombers, or make strafing attacks. Bombers can be assigned to only one type of mission—bombing attacks. The Luftwaffe will generally enjoy complete control of the air.

The player selects battle intensity for each area under attack. Battle intensity can range from one to four; the higher the intensity, the greater the casualties suffered by both sides. Once the intensity has been specified, the computer resolves and displays the results of the German air and ground attacks, followed by the Russian counterstrikes.

Victory in *Panzers East!* depends on the control of certain vital areas. At the beginning of the game, the player rates the fulfillment of various general campaign objectives, such as the capture of Soviet population centers, according to priority. Any combination of priorities can be selected. Thus, it is possible to assign the highest or lowest priority to all of the listed objectives. The computer then analyzes the player's choice of objective priorities and designates specific map areas as major and minor objectives. The Germans and Soviets receive points for possession of these areas at the end of the game.

Points are also awarded for the control of non-objective areas as well as for the number of surviving air- and ground-strength points on both sides. The player additionally receives points for voluntarily ending the game before the twenty-fourth turn. This simulates the calling to a halt of the offensive and giving the German troops time to prepare for the winter.

The ratio of German to Soviet points determines the level of victory, ranging from a Russian total victory to a German total victory. Draws are also possible. Incidentally, when saving a game, the computer tabulates victory points and the level of victory up through the turn in progress. Thus, the game-save function can be used to check your progress periodically and to see if a German victory has been achieved before making the decision to end the game early.

Panzers East! rewards good planning. Avoid making the same mistake the Germans committed in 1941—trying to accomplish too much. Amazingly enough, the original German plan called for the occupation of everything westward from Archangel to Astrakhan—in other words, the entire map! In *Panzers East!*, the computer will tempt you into making the identical error by assigning more objectives than can possibly be carried out.

Choose one region to make your main thrust, preferably the region that contains the bulk of your objective areas. Concentrate the majority of your army, particularly strength points, in that region and conduct only very limited offensives in the regions of secondary importance.

As a cardinal rule, do not fight at all once the weather turns nasty. Casualties will be heavy and very little, if anything, will be accomplished. If you have not won by the end of the good weather in October, then the game in all likelihood has already been lost.

Panzers East! introduces the element of "fog of war" by not revealing the strength of Soviet forces in an area until German troops actually enter that area. The Germans possess some intelligence capabilities which can provide the player with estimates of Russian strength in a limited number of areas per turn. However, besides the sketchy information as to Russian troop dispositions, there exists one further impediment to effective planning—the rule book.

The documentation accompanying *Panzers East!* supplies sufficient instructions to play the game without difficulty, but certain aspects of the game's mechanics will remain a mystery, even after repeated playings. For example, each week the computer updates the supply status of every area occupied by your German infantry and points. The supply status of any area, varying from poor to maximum, in turn affects German attack strength. During mud weeks, the supply status of an area drops one level, which is self-explanatory, but snow reduces supply by "about half a level." About half a level? If points attack at a normal strength when supply is good, and half strength when supply is moderate, what happens when supply falls about halfway between good and moderate?

As history, *Panzers East!* works surprisingly well for a game of low complexity, although the use of an area map results in some distortions. For instance, the main weight of the German attack historically fell on the northern portion of Byelorussia, avoiding the strong Soviet troop concentrations in the southern half. However, the player cannot do this in the game as Byelorussia is represented by a single area.

Also, two out of the three major jump-off areas for the Germans on turn one are adjacent to only one Soviet area apiece. Since German and Soviet starting troop dispositions never vary, the opening move of the game will therefore almost always be exactly the same.

These complaints notwithstanding, *Panzers East!* creates a feel for World War II. During the course of a game, the player will face many of the identical strategic challenges that confronted the German high command in 1941: the difficulty of conducting a campaign across an ever-widening front; the threat of partisan activity behind the lines; the crippling effects of mud and snow; and the steady whittling away of the German Army's superiority with each passing week.

Panzers East! also has a strong replay value. Each completed game draws the player back for more, either to experiment with a new strategy or refine an existing one. In a market crowded with other products clamoring for the gamer's attention, this game is a good choice. ◼

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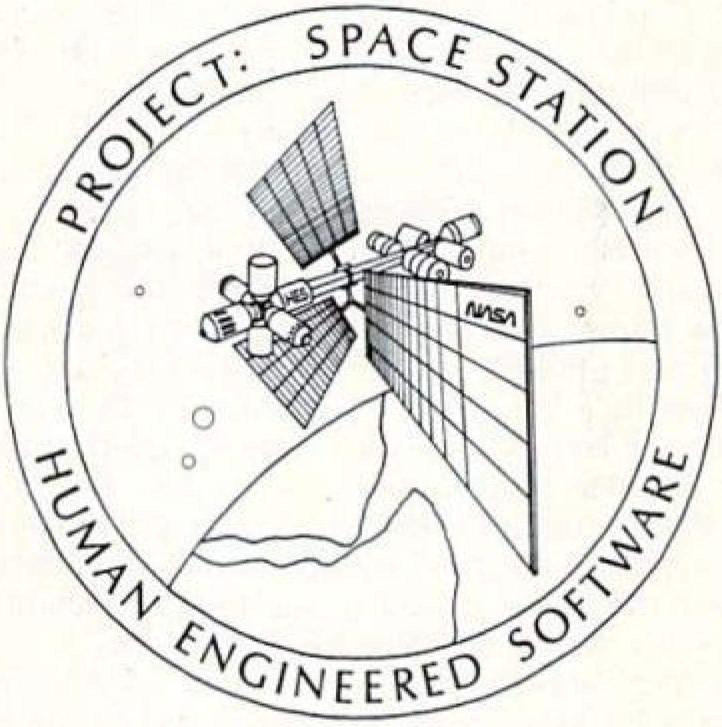

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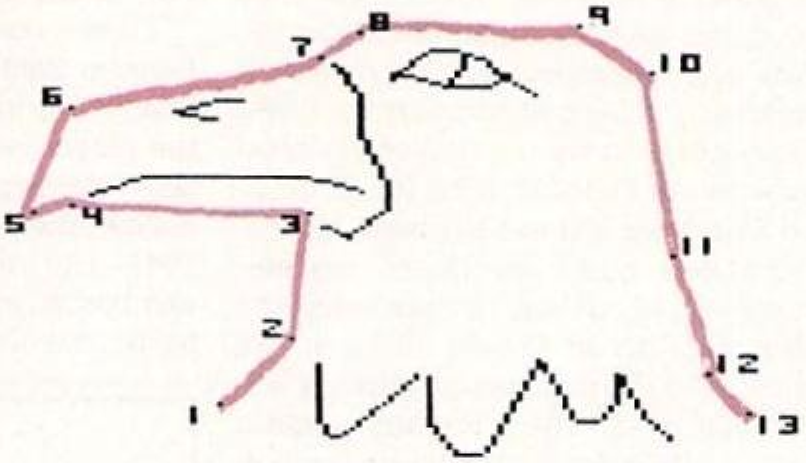
REVIEWED BY TOM BENFORD

Rainy Day Fun

Computer: Commodore 64
Publisher: Thorn EMI
P. O. Box 10425
Costa Mesa, CA 92626
Medium: Disks
Price: $39.95

The program is so good, it makes you look forward to a rainy day.



Rainy Day Fun is supplied on two disks and accompanied by an excellent user manual. It comes packaged in an album-style plastic case that provides storage and protection, and either the keyboard or a joystick may be used. *Rainy Day Fun* also supports most popular Commodore and Commodore-compatible printers.

Although it is primarily intended for use by youngsters, I'm sure parents will enjoy using the program as well. Here are just some of the activities available for those rainy days.

Dot-to-Dot: This feature selects from over 50 available connect-the-dots pictures. The pictures may be created on the computer screen or printed out on a dot-matrix printer. The pictures may then be colored in on the computer or with crayons on the hard copy. The dots may be connected "freehand" using the joystick or keyboard, or with the help of the computer, which helps keep the connecting lines a bit more tidy (especially useful for the younger artists).

Mask Maker: Create all sorts of crazy masks with this option. Features may be changed to create some really interesting (and scary) masks. The change options include altering the right eye, left eye, mouth, chin, nose and hair, with five variations per feature. Once the mask is completed, print it out, paste it to some cardboard, color it in, and wear it!

Pin the Tail on the Donkey: This standard party game takes on a new dimension thanks to computer animation. Ever try to pin the tail on a moving donkey? How about trying to pin it on an invisible donkey? These two variations on an old theme are not only entertaining, but challenging as well.

Invitation maker: Planning a party? *Rainy Day Fun* allows you to choose from birthday, valentine or halloween invitations, or create your own from scratch. Fifty stock pictures are provided for giving your card that custom look, and you can combine text and drawings together on the invitation. A special feature also allows you to print separate invitations for up to 20 people.

Fortune Teller: The Wizard resides on the program disk, and he will answer any question you ask. While these answers are often round-about and sometimes evasive, they provide an interesting display of simulated artificial intelligence. The Wizard practices his craft from a spooky castle, complete with bats in the belfry. Sometimes the Wizard's answers sound as if *he* has his share of bats in his own belfry. When he gives a nonsensical or outlandish answer, simply ask him again.

Banner Maker: This feature allows you to create a banner up to 128 characters (spaces included) long. Three type styles are provided, and pictures may be incorporated into the banner as well. Of course, you can print the banner on your printer and color it in if desired.

Mouse Maze: Mortimer Mouse is stuck in the middle of a maze and you must get him out. Either the joystick or keyboard can be used to guide him. Both freehand and computer-guided modes are available.

Coloring Book: Why buy a coloring book when you can create your own with *Rainy Day Fun*? Coloring may be done on the computer using seven different colors and four different "crayon" sizes, or the pictures may be printed and then colored by hand. Over 50 different pictures are available and the subjects range from simple to moderately complex.

Paper Airplane Maker: Patterns for several different types of paper airplanes are provided. The airplanes can even be rotated on the screen to help you choose. The chosen pattern can be directed to the line printer, complete with fold and trim lines, so even the novice "paper pilot" can create a craft that flies. (I was amazed at how well some designs performed.)

Sliding Puzzles: Remember those plastic sliding-square puzzles that were so popular a few years ago—the kind that usually had a keychain attached? Three varieties of these sliding puzzles are included in *Rainy Day Fun*: a picture puzzle, number puzzle, and alphabet puzzle. These puzzles keep both children and parents amused and challenged.

The user manual for *Rainy Day Fun* provides all pertinent information on the program's different features, and also provides parents with several good ideas for keeping the child's interest perked. The 28-page book is well illustrated and is very complete.

The program is a joy to use and requires little, if any, parental intervention. All of the options and functions are menu-driven, and icons are used throughout. While the packaging doesn't state the ages for the intended users, I'd say that anyone from pre-school through senior citizen can find something of value, interest and entertainment in *Rainy Day Fun*.

I have no reservations about recommending *Rainy Day Fun*. I found it to be all it claimed to be and more. The program is so good, in fact, it makes you look forward to a rainy day. Don't wait for the clouds, though—you can use and enjoy it just as much with the sun shining! ■

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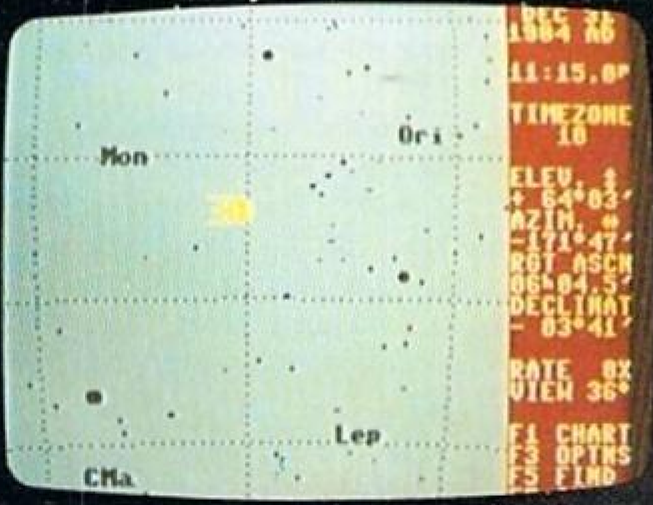

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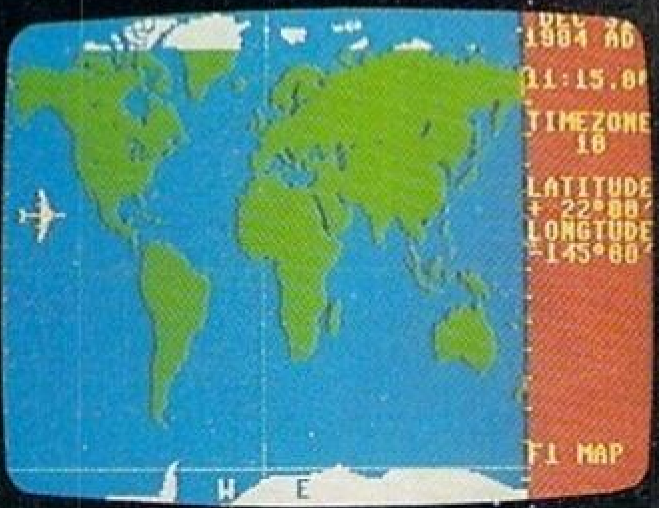

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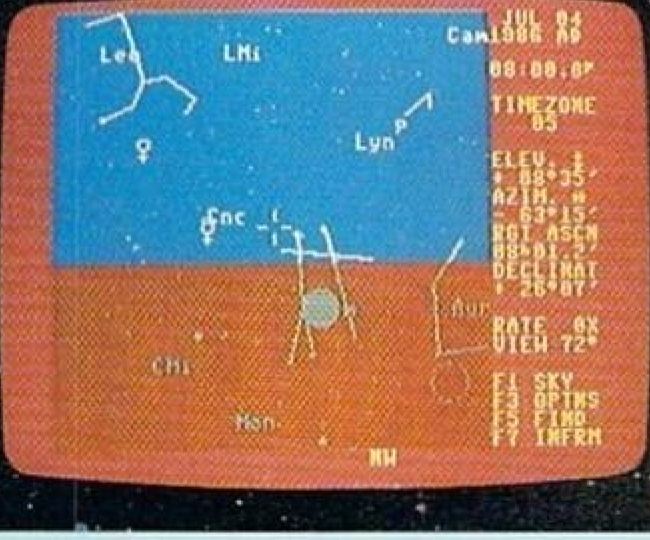
THE MAP MODE



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COMMODORE

THE OFFICIAL COMPUTER COMPANY for the Young Astronauts Program

MODERN WA

BY ARNIE KATZ

Military simulations—war games—existed in antiquity, but they remained the exclusive province of generals and admirals until the late 1950's. That's when Charles Roberts introduced the first military strategy game for the general public, "Tactics II." The firm he started, Avalon Hill Game Company, has published dozens of titles over the years, giving armchair Eisenhowers the chance to refight battles from Caesar's campaign in Gaul to the fictional combat of the world Robert A. Heinlein created in "Starship Troopers."

Now the computer is revolutionizing those war games. Electronic combat simulations are rapidly gaining popularity, even as the ones which use map boards and cardboard counters have reached a plateau. It may be a few years before gamers are able to choose from a really comprehensive library of military simulations, but that time is coming. Computer war games have now overcome initial skepticism among serious war gamers, who have found the advantages of microprocessing impossible to resist.

The greatest contribution of the computer to war gaming is its ability to shoulder the burden of voluminous record keeping. A military simulation is a mixture of realism and playability. Sad to say, as the designers of board games achieve more realism, they endow their creations with less playability.

Players of electronic war games, on the other hand, can have it both ways at once. The computer handles the "grit" of the game, the million-and-one tiny details which work together to simulate a given situation. So, war gamers no longer need to memorize a

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hundred special terrain rules for every title. In most cases, the program itself applies such factors automatically.

This is particularly handy when simulating the complexities of modern warfare. Situations which involve several hundred units, such as D-Day and the Battle of the Bulge, are a lot easier to manage when there's a machine to correctly position each unit, evaluate the effects of supply and terrain, and adjudicate combat.

It also cuts the time needed to play most titles. A computer simulation takes from two to three hours to play. By comparison, the more advanced board games can easily swallow an entire weekend. Most electronic military simulations also provide a reasonably skillful computer adversary for solitaire play. Surveys indicate that more than half of all military-theme board games are played by one person who directs both sides. The schizophrenia of this play method is alleviated by having an electronic opponent.

Re-fighting the Second World War

World War II is indisputably the most popular period for simulation. There are already many computer programs that re-create the major air, land and sea battles of that epic conflict. By comparison, there is exactly one program based on World War I (*Eagles* by Strategic Simulations), and none rooted in the Korean police action.

Battle for Normandy (Strategic Simulations) is a logical place to begin any examination of World War II simulations, since it is based on the single most important engagement in the struggle, D-Day. The Allied general commands brigades, regiments and divisions in this re-creation of the landing and subsequent breakout.

The player must first establish a viable beachhead and then drive to

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major objectives like Caen, St. Lo and Cherbourg. Each of the game's 12 turns represents two days of actual fighting. Thanks largely to its easy-to-learn movement and combat rules, *Battle for Normandy* progresses very quickly and usually maintains a high excitement level right to the final move.

Most Battle of the Bulge games concern Allied efforts to blunt the force of Hitler's desperation offensive. *Breakthrough in the Ardennes* (Strategic Simulations) turns the situation around. This demanding military simulation tests the armchair commander's ability to force a breakthrough against the determined, computer-directed Allied defense.

The 1941 German invasion of the Soviet Union ranks as one of the largest military operations in history. *Panzers East!* (Avalon Hill Microcomputer Games) is a solitaire contest in which the player attempts to out-do the German generals' actual achievements. The goal, conquest of key positions in European Russia, must be accomplished in a mere 24 weeks. And though the German side begins hostilities with a vast superiority of forces, it takes tenacity and daring to attain the desired goals.

If you've refought all the actual battles of World War II, try the fictitious one depicted in *Dnieppper River Line* (Avalon Hill Microcomputer Games). This solitaire program is an exercise in creative defense. The computer guides the Soviet forces in a thrust at Germany's Army Group South in Byelorussia, circa 1942.

The Russians mount quite an attack in this hybrid computer/board game. Besides the usual masses of troops, the robot field marshal can call upon artillery barrages, partisan attacks and parachute drops.

Adding to the player's predicament is uncertainty concerning the Russians' objectives. Part of the game's tension arises from the defender's need to quickly analyze the computer's attack plan and allocate defending forces efficiently.

Air strikes, corps artillery, bridge construction, and the weather all play key roles in the treatment of this fascinating battle. Each unit that participated in the action is rated for such factors as combat strength, fighting efficiency and supply status.

Supply, reinforcement and intelligence are the three biggest problems facing players who wish to refight the North African campaigns of 1941-1942 in *Knights of the Desert* (Strategic Simulations). The sweep of movement is exhilarating as the armies ebb and flow across the multi-screen map board in this program for one or two strategists. This creates the kind of fluid, rapidly-changing situations that produce the ultimate in wargaming thrills and challenge.

War gamers no longer need to memorize a hundred special terrain rules for every title. In most cases, the program itself applies such factors automatically.

Tactical Design Group, who authored *Knights of the Desert*, went to the other temperature extreme with *Tigers in the Snow*, a Battle of the Bulge contest by Strategic Simulations. Although *Tigers* is especially suitable for novice war gamers, it boasts the authentic feel of the conflict it attempts to reproduce.

Panzer-JAGD (Avalon Hill Microcomputer Games) presents a highly playable look at armored combat on the Russian front during World War II. It includes aspects of mechanized warfare such as hidden movement, line-of-sight, and terrain, but the program's greatest strengths are attractive audio-visual trimmings and extreme ease of play.

The gamer controls an assault force of 25 tank and infantry units which must seek and destroy many hidden defense points to clear the path for a forthcoming major attack. The joystick-activated order-entry system, further buttressed by a system of onscreen prompts, lets the player complete a game of *Panzer-JAGD* in an hour or less.

Fighter Command (Strategic Simulations) recalls the heroic stand of the RAF against the metal wave of the Luftwaffe. Charles Merrow and Jack Avery, the designers, have pulled out all the stops to make this strategic contest outstanding in every respect. The human player gets a real feel for the problems the numerically inferior fighter squadrons had against the onslaught of Germany's air arm.

Wings of War (Strategic Simulations) features plane-to-plane combat involving the aircraft flown by Japan, Britain, Germany and the United States in World War II. Each aircraft is rated for speed, maneuverability, and climbing and diving. There are even different grades of pilots.

Two scenarios are included exclusively for the solitaire gamer, and two others offer one- or two-player action. There's even an "air race" variation for those who want to fly rather than fight.

Midway Campaign (Avalon Hill Microcomputer Games) is a solitaire evocation of one of the Pacific theater's turning points. The computer commands the Japanese force's attack against the beleaguered Americans. Although *Midway Campaign* is marred by primitive visuals, the simulation itself is reasonably faithful. There's also a Midway scenario in Gary Grigby's *Carrier Force* (Strategic Simulations), a highly advanced game depicting major Pacific naval battles. Other actions covered by this exceptionally detailed simulation are Eastern Solomons, Coral Sea and Santa Cruz.

Two programs, *Computer Bismarck* (Strategic Simulations) and *North Atlantic Convoy Raider* (Avalon Hill Microcomputer Games), reproduce the hunting of the German battleship Bismarck. The latter also includes scenarios for more general action involving Germany's efforts to disrupt shipping to Great Britain and France during the early stages of World War II.

While many military simulations involve the titanic clash of whole armies, navies and airforces, a few strive to give players the vicarious experience of small-unit combat. They ignore the strategic aspects of warfare and concentrate on the proper deployment and utilization of squads or individual soldiers.

The grandfather in this category is *Computer Ambush* (Strategic Simulations). Its publisher has wisely updated the original design to give this classic most of the features gamers expect from contemporary software products. One or two gamers command squads of American and German soldiers in a variety of scenarios set in a mythical, but typical European town.

Every trooper and non-command squad has a distinct personality and a unique set of strengths and weaknesses. The player must not only choose the proper tactics, but also pick the right man to execute them. There's no sense assigning an inept marksman to tasks which require sharpshooting, for example.

Each soldier moves individually in *Computer Ambush*, which introduces a fair amount of complexity. The codes which the player must enter through the keyboard are logical, but playing a game can take a long time until you gain experience.

T.A.C. (Avalon Hill Microcomputer Games) differs from almost all other computer war games in one major respect: It also employs a conventional board and cardboard counter to simulate tactical armored combat involving the U.S., Great Britain, Germany and Russia.

The video tanker uses "purchase points" to select a force from a surprisingly complete roster of hardware. Weapons are rated for such factors as the angle-of-fire of its main gun and the varying thicknesses of armor on its front, side, top and bottom. Five different scenarios may be played on the beautifully executed map board, which measures 15 screens wide. Even the sound is first-rate, especially compared to most other military simulations.

Operation Whirlwind (Broderbund) weds the excitement of real-time action to the mental stimulation of military strategy and tactics. In this solitaire game, the human command must direct armor, infantry, engineers and artillery across the high-resolution map screen to capture an enemy town. The speedy joystick-activated order-entry system makes *Operation Whirlwind* a real nail-biter.

Field of Fire (Strategic Simulations), the latest entry in this category, follows the exploits of one of America's most decorated units, Easy Company of the First Infantry Division, through North Africa and Europe. As company commander, you control six-man fire teams in a range of dangerous situations from storming Omaha Beach on D-Day to fighting a delaying action during the Battle of the Bulge.

The computer handles the other side in this solitaire contest and can fight at any of three skill levels. Tactics such as concentration of force, cover fire and selective maneuver, which larger-scale simulations handle abstractly, become central issues in *Field of Fire*. Exceptional sound and graphics create the proper ambience for this small unit *tour de force*.

> *Most Battle of the Bulge games concern Allied efforts to blunt the force of Hitler's desperation offensive.* Breakthrough in the Ardennes *turns the situation around.*

Fighting in the Near Future

"What if?" is always a fascinating question. Quite a few computer military simulations face the future, rather than the past, and attempt to predict the nature of potential conflicts.

The "When Superpowers Collide" series produced by Strategic Simulations focuses on the possible course of another war in Europe. Those who overcome the paranoia sparked by the fact that all four existing titles are set in 1985 will discover a meticulously crafted group of games.

Germany 1985, the first game in the series, sets up the rules systems which the succeeding titles employ with minor variations. It pits the outnumbered forces of NATO against the lightning attack of the Warsaw Pact.

RDF 1985 concerns a hypothetical confrontation between East and West over the Mideast oil reserves. It uses the same basic system as *Germany 1985*, adapted to special situations which occur in one of the world's genuine military danger zones.

The situation in *Baltic 1985* is critical for the U.S. and its allies. The Soviet forces have halted at the Rhine, but reinforcements are on the way. The NATO commander must relieve the pressure on Berlin by linking up this bastion with the main body of troops before it is overrun.

Baltic 1985 uses a larger map scale than previous programs in this series, which gives it more of a strategic feel. Weapons ranges, unit movements and sighting distances are smaller, relative to the area represented by the play field. This forces the commanders to constantly consider the overall situation as well as the individual skirmishes.

Norway 1985 (Strategic Simulations) has all the virtues of the three previous titles in the series, plus a few new wrinkles. This game posits a Soviet attack across the frozen fields of Norway. Ski troops become a vital cog in the Allied defense in this one- or two-player contest.

Mech-War (Strategic Simulations) adapts the system introduced in *Kampfgruppe* to the subject of land warfare in the 1990's. Practically every U.S., Russian, British and West German land-based weapon is figured into the game.

One or two players can choose from among four prepared scenarios set in West Germany, or they can use the simple instructions included with the title to design new ones. A highly desirable feature is that the computer can direct either side in the solitaire mode.

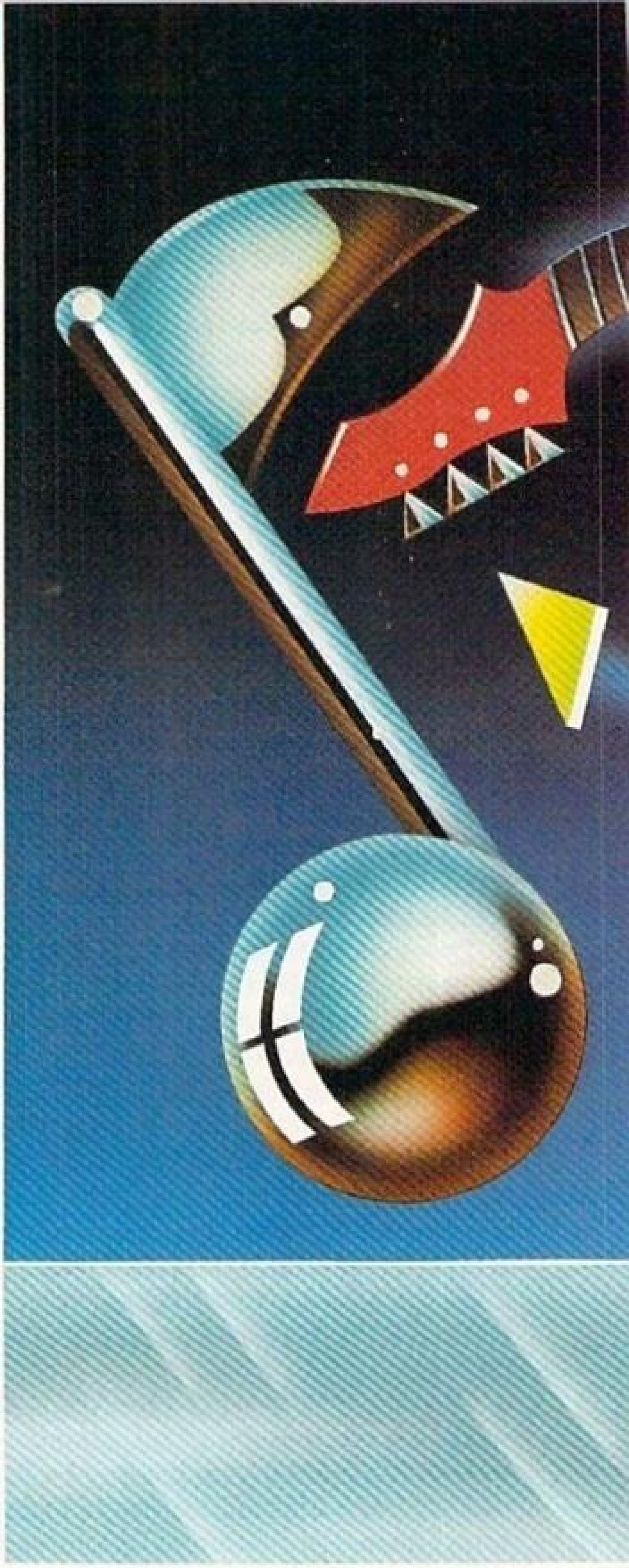
War of the Worlds (Task Force Games) offers a refreshing change of pace for veteran war gamers who have become jaded, however temporarily, with purely human conflicts. Its streamlined rules and abstract combat resolution routine may give it appeal to many gamers who ordinarily shun the more complex military simulations.

Based on the famous H.G. Wells novel, *War of the Worlds* simulates an attack by Martians against the Earth. The player commands the defenders in this solitaire contest and tries to prevent the denizens of the Red Planet from establishing a beachhead in Great Britain.

Joseph A. Delinski has designed the game so that the Martians are bound to make progress in at least a few sectors, no matter how ingenious the defense. The frantic struggle to plug up the holes before the Martians break through in force generates most of the excitement in *War of the Worlds*.

Whether your particular interest is in land, sea or air warfare, there are now well designed, mentally challenging programs that fill the bill. And with a flock of new titles and conversions from other systems on the way, it looks like electronic war gamers with a Commodore 64 will never have to dread an unexpected outbreak of peace.

64 Ways to Make Music



by Peggy Herrington

Deciding which music package you'd like depends on how much time, effort and interest you have, how much musical knowledge you start with, and what you want to accomplish. You can do a lot more with a computer than a piano, for instance, so learning to "play" your 64 is not as simple as merely sitting down to practice.

Will you want to make music in a relaxed atmosphere, programming it in one step and then hearing it in another? Or do you long to jam, pitting spontaneous melodies against pre-recorded accompaniments? Will the music alone be enough or will you want to have computer graphics with your tunes? If so, do you want to add music to programs you've written from scratch or will running your music/graphics combo within the composition program suit you? Or how about an introduction to music theory? Or putting your feet up and simply being entertained?

There are many ways to approach the Commodore 64 musically, and the products mentioned here run the gamut. While there is some overlapping of features, I've organized them into categories by what I think they do best.

Performance Keyboards

To perform live on the 64 most easily, you'll need a piano-type add-on keyboard. These hardware devices are available in different sizes and neither enhance nor detract from the sound of the 64. They just make it easier to play. Whether a keyboard will play three-note chords (polyphonic) or only one note at a time (monophonic) is determined by the software that controls it. Sometimes, deciding between polyphonic and monophonic modes involves a trade-off. For instance, the ability to make more than one sound at a time might have to be sacrificed so that two or three of SID's oscillators can work together to make a more complex (and therefore more interesting) sound. Mono mode can also mean that one voice is available for you to play on the keyboard against a two-part accompaniment being played by the 64.

The *SoundChaser 64* add-on keyboard from Passport Designs offers four octaves of sound from 49 full-sized piano keys. It comes with performance software for both polyphon-

ic and monophonic modes. Thirteen complex pre-set instrument sounds in monophonic mode include some of the most fabulous sounds you've ever heard, and six more pre-sets are supplied for playing in polyphonic mode, three notes at a time. These pre-sets can be changed, but you can't save your changes to disk. Screen displays include instructions and SID settings. To write and save your own three-part music with the *SoundChaser* keyboard, you'll need the *MacMusic* software. *Computer HitWare* changeable pre-programmed music with graphics is also compatible.

The *Incredible Music Keyboard* from Sight & Sound is a plastic keyboard overlay that fits on top of the 64 keyboard and activates the computer keys as you press its 24 miniature piano keys. It comes with two song books and performance software with three user-changeable pre-sets in polyphonic mode, or five rhythmic two-part accompaniments with which you play the lead instrument live. To really perform on this little keyboard, you'll want the *Kawasaki Rhythm Rocker*, a separate double-sided disk with pre-recorded rhythm and bass tracks, which you can change as you play lead synthesizer using pitch bend, vibrato and space sounds. User-changeable high-resolution graphics scroll across the screen as you play.

The keyboard overlay can be used with most of Sight & Sound's programs, many of which have been recently upgraded. If you own an older program, you can keep your original and buy an upgraded disk for a small fee: a new disk for the Incredible Music Keyboard is $7.00, a new *Rhythm Rocker* disk is $15.00. Contact Sight & Sound for details.

The *Music Port* from Tech Sketch is a 2-1/2 octave, full-sized keyboard with alternate light pen note entry (which wasn't quite ready at press time, so I couldn't try it out). The disk that comes with the keyboard allows live three-voice performance as well as playing lead with pre-recorded accompaniments and user-controlled progressive key changes. You can write and record your own songs (to disk) either polyphonically or by overdubbing. The screen displays the three notes being played, text and graphics. Although this program isn't as "slick" as many others on the market now, it includes both performance and composition software with the keyboard.

Making music with "recording studio" software lets you enter notes and then adjust tempo, instrumentation, and so forth, as you listen to it being played back.

Keyboards/Recording Studios

Since live performance is the only way a traditional musical instrument *can* be played, some people don't realize there is another way to play a synthesizer. This other way is a two-step process of first entering notes and SID parameters, and then playing back the music. Some packages designed for this method of music composition offer piano-type keyboards to facilitate note entry. Making music in this manner is, without exception, much easier than playing a regular instrument because you don't have to concern yourself with any performance technique—things like fingering, staying with the rhythm, or playing up to tempo (speed). Since it has three oscillators, or voices, the 64 can—with the right software—sound like three musical instruments, plus be a tape deck (disk) and mixer (filters). That means you can pre-record music very slowly, one voice at a time (called overdubbing or laying down tracks), and then adjust the tempo and instrumentation while listening to the song.

The 40-key, three octave keyboard from Melodian comes with a beautiful program called *ConcertMaster*. To overdub with different pre-set instrument sounds, you record one voice after the other, adjusting other parameters after you finish composing, as you listen to the music, and then save it to disk. Thirty-five sample songs are provided and standard music notation scrolls across the screen. *RhythmMaster*, another program that teaches meter and beat is also available. Both *RhythmMaster* and *ConcertMaster* work without the Melodian keyboard and have music tutorials in the documentation.

Entech's *Studio 64* (which is also MIDI-compatible) works with the *Music Mate* keyboard from Sequential Circuits. When using *Studio 64* without the keyboard, you play the 64 like a piano. Voices are recorded separately on tracks, but music notation for only one voice scrolls across the screen during playback. Each note can have a different sound and, with *Add Mus'In*, a separate utility, music written with *Studio 64* can be added to your own programs. *Lead Sheet Writer* prints out music notation and lyrics.

Music Writer-"64" from Double E Electronics is a strong music recording program with some unique features (fast forward/reverse scrolling of three music staves, an edit mode, and the ability to play music backwards, for instance). There is no piano-type keyboard for it—you play on the 64 or enter music alphanumerically.

Sequencers

Sequencers work best when you want to record the repetitive musical phrases often found in popular music, although they're not limited to that. You record sequences of notes for each voice separately, then organize them with each other for playback. Sequencers often allow meticulous music editing features that make them particularly attractive to composers. *Music Mate* from Sequential Circuits is an add-on keyboard with 2-1/2 octaves and 32 piano-sized keys. The software that comes with it lets you play live and record ten minutes of music—but not save it to disk. However, Sequential offers four programs which work with the Music Mate keyboard. *Song Builder* lets you record three-part sequences on disk and draw from a library of pre-set instrument sounds. With *Song Editor* you can arrange music you saved with *Song Builder*, and fix notation and timing errors. Music is displayed in standard music notation. You can also experiment with combinations of user-changeable sound pre-sets with *Sound Maker* and save them for use in compositions. In addition, *Song Printer* prints tunes in standard music notation on a dot matrix printer. These four programs are strong, functional music utilities without colorful screen displays or other diversions.

The *Incredible Music Keyboard* from Sight & Sound is monophonic using the company's *3001 Sound Odyssey*. *MicroSynth*, the resident composition program, comes with 100 pre-sets and several sample songs. Polyphonic sequences can be recorded by changing SID parameters and pitch with a joystick on a SID-control screen display, and a separate, interactive synthesizer tutorial on disk that helps you fiddle around with SID and learn how it works.

The *Kawasaki Synthesizer* also works with the keyboard overlay. With *The Composer* software, you record, arrange and save sequences to disk, or play live with pre-recorded two-voice sequences. Notes entered on the keyboard show up on the screen as blocks of letters and symbols which change color. The keyboard becomes polyphonic when you use *The Performer*, a program on the second disk. Use over 500 pre-sets to play (but not record or save) three-part music, or play the lead with a supplied bass and drum sequence. Documentation and graphics displays have a delightful oriental flavor.

MusiCalc I is an elaborate sequencer that doesn't use standard music symbols. Music can be entered from Waveform's *Colortone Keyboard* or from the Commodore 64's keyboard by using the letter names of notes. The main screen has a colorful panel of SID-control sliders, and a play grid which shows the voices stepping through their sequences. Thirty-two three-voice pre-set instrument sounds with corresponding sequences can be interchanged and you can use these or design and save your own. *MusiCalc II* prints standard music notation on your dot matrix printer and *MusiCalc III* is a huge collection of pre-set instrument sounds you can use with the main program.

Joystick Note Entry

Another two-step method of composing music uses a joystick to point at music symbols on the screen and drag them to a music staff where they're put in place with the fire button. After composition, you tell the computer to play the tune.

Passport Design's *MacMusic* accepts notes from the *SoundChaser* 64 keyboard or joystick input. Pull-down menus and icons are featured (hence the name) and you can draw musical ideas with a joystick, and see and hear them played backwards or up-side down, if you want. The scrolling screen notation is a variant of standard. Creative composition features, thirteen instrument pre-sets and ten arrangements of popular songs ("Chariots of Fire" is impressive) make this a flexible, appealing program.

The *Music Shop* from Broderbund is a beautifully done, serious composition program with full access to SID and features like vibrato, verify timing, print and undo. Icons, pull-down menus and windows with dialog boxes make it easy to operate and enhance the screen display (which looks just like about half a page of printed sheet music). There are 28 classical music samples.

The *Music Studio* from Activision is icon-based with two joystick-controlled composition areas. The music is simplified in the "novice area," with pre-sets shown as tone colors, for example. The "advanced area" uses standard notation, with complete access to SID, block moves and even song lyrics. Music composed in one area can be transferred to the other easily.

Super Music Box can be used with joystick or Super Sketch graphics tablet (although you can't create graphics). Music notation scrolls as the music plays and four vanilla-flavored songs are provided. You can't use ring modulation or synchronization, however, and cut-and-paste works only in forward.

The much-touted *Music Construction Set* from Electronic Arts works fine on the computer it was originally designed for, but something was lost in the translation to the 64, something like the SID chip, maybe? Instrument pre-sets are limited to two (one for each music staff), yet SID has three voices and can accommodate a pre-set for each. The pre-sets are fixed, rather than user-changeable. Two volume controls are on the screen even though SID uses one. In short, the software under-utilizes SID, and many 64 owners may not know what they're missing.

Keyboard Entry

In some composition software, the Commodore 64's cursor keys are used to position notes on a music staff, their relative positions establishing the voicing and duration. It's a process that is easier and faster to do than to describe.

64 Ways to Make Music

Add Mus'In
Entech
P.O. Box 185
Sun Valley, CA 91353
213-768-6646 $ 39.95

Allegro
Artworx Software
150 North Main St.
Fairport, NY 14450
800-828-6573 $ 39.95

Auricle
Auricle Control System
3828 Woodcliff Road
Sherman Oaks, CA 91403
818-990-8442 $500.00

Bank Street Music Writer
Mindscape Inc.
3444 Dundee Road
Northbrook, IL 60062
800-221-9884 $ 49.95

Bravo!
HesWare
150 N. Hill Drive
Brisbane, CA 94005
415-468-4111 $ 29.95

CocoNotes
CBS Software
One Fawcett Place
Greenwich, CT 06836
203-622-2500 $ 12.95

Colortone Keyboard
Waveform, Inc.
1912 Bonita Way
Berkeley, CA 94704
415-841-9866 $ 49.95

ConcertMaster
Melodian, Inc.
115 Broadway, Suite 122
New York, NY 10006
212-406-5163 $ 39.95

Dancing Feats
Softsync, Inc.
162 Madison Avenue
New York, NY 10016
212-685-2080 $ 29.95

Designer's Pencil
Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
800-227-9759 $ 34.95

Duran Duran Hitware
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $ 19.95

Guitar Master
MasterSoft
P.O. Box 1027
Bend, OR 97709
503-388-7654 $ 49.95

Halftime Battlin' Bands
CBS Software
One Fawcett Place
Greenwich, CT 06836
203-622-2500 $ 12.95

Incredible Music Keyboard
Sight & Sound, Inc.
3200 South 166th St.
New Berlin, WI 53151
800-558-0910 $ 29.95

Kawasaki Rhythm Rocker
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 29.95

Kawasaki Synthesizer
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 29.95

Lead Sheet Writer
Entech
P.O. Box 185
Sun Valley, CA 91353
213-768-6646 $ 39.95

MacMusic
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $ 49.95

Master Composer
Access Software
3678 West 2100 South
Salt Lake City, UT 84120
801-973-0123 $ 39.95

Melodian Keyboard
Melodian, Inc.
115 Broadway, Suite 122
New York, NY 10006
212-406-5163 $199.95

Moondust
Creative Software
960 Hamlin Court
Sunnyvale, CA 94089
408-745-1655 $ 14.95

Movie Musical Madness
CBS Software
One Fawcett Place
Greenwich, CT 06836
203-622-2500 $ 12.95

Music Construction Set
Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
415-571-7171 $ 39.95

Music Made Easy
Alfred Publishing Co.
P.O. Box 5964
Sherman Oaks, CA 91413
818-995-8811 $ 29.95

Music Maestro
Springboard
7807 Creekridge Circle
Minneapolis, MN 55435
800-328-1223 $ 34.95

Music Mate Keyboard
Sequential Circuits
3051 North First St.
San Jose, CA 95134
408-946-5240 $ 99.00

Master Composer from Access flips screens of standard music notation as the music plays. Eleven user-changeable pre-sets are provided, and SID can be fully accessed. Relocatable, interrupt-driven music files are created and can be easily added to existing programs.

Bank Street Music Writer from Mindscape is another translation of a composition program that was originally written for a different computer. It has good documentation and nice screen displays with some really good features including triplets, repeats and dynamic controls, but very limited access to SID's special features.

Sing the Notes In!

New on the market is a method of entering notes by singing into a microphone attached to the Commodore 64. *Voice Master* from Covox is a voice digitizer and recognition unit with an intriguing new music composition feature: As you sing (or whistle) a melody into the microphone that comes with it, SID plays the same tune, seemingly right along with you. Notation is displayed on a music staff on the screen. Actually, your voice is digitized as you sing and the pitch is extracted and used by SID, along with pre-set instrument settings, to produce the sound. The delay is just barely noticeable if you listen carefully (which isn't easy to do while you're singing). This is a brand-new way to access SID, so the software that comes with it doesn't accommodate a second voice or do anything fancy yet.

Music Videos

Non-game programs which combine music and graphics are often called "music videos," and the Commodore 64 is especially well-suited for creating them. Software is available to help you create both music and graphics or to write music that you can add to programs (games, for instance) which you've written yourself.

For instance, you can create music with the *Music Processor* from Sight & Sound (upgrades are $15.00) by one of three methods: using the Incredible Music Keyboard, playing the 64's keyboard as a piano, or using the resident music programming language that lets you enter (and edit) music alphanumerically. Ninety-nine instrument pre-sets are supplied.

With the *Music Video Kit*, you can design a high-resolution background screen and up to five sprites, which you can animate. With the background on the screen, you then play the music while leading each sprite one at a time around the screen with a joystick. It's recorded automatically, and you can then sit back and watch your music video.

If you're not long on creativity, you can simply recombine or personalize the graphics and music provided on the program disks: 26 high-resolution backgrounds, 60 sprites and 10 songs on the *Music Video Kit*; 14 songs on the *Music Processor*; and 8 songs on each of the Sight & Sound's four *Computer Song Albums*.

Programmer's Aids

You can also create graphics/music combinations with Activision's *Designer's Pencil*, or *Simons' BASIC* and *SuperExpander 64* from Commodore, as well as other programming aids. The emphasis here is on graphics, however, so you'll need a fair knowledge of music to add any sophisticated sound. None contains extensive music or graphics libraries (like the Sight & Sound series) to get you started.

Adding music to a free-standing BASIC program isn't as easy as it sounds, because the graphics pause while SID plays. This isn't a problem if the music is in interrupt-driven machine code. If you aren't a machine language programmer, these composition programs, described elsewhere in this article, create such music files and allow you to add them to your own programs: *Allegro*, *Master Composer*, *Note Pro II* with the *Note Pro Bridge*, and *Studio 64* with *Add Mus'In*.

Music is entered alphanumerically with these programs, by letter, name, and number. This method appeals to programmers because, for them, it's more accurate and easier to debug than standard music notation.

Allegro (formerly called *P.A.S.S.*) from Artworx, compiles music files written with it in FORTE, a music programming language derived primarily from FORTH. *Allegro* offers full SID access and 50 pre-set instruments, modulation, pulsewidth sweeps, echoing, wah-wah, heavy metal and other impressive pre-programmed musical effects. *Allegro* is compatible with the Incredible Music Keyboard from Sight & Sound, but also allows music entry alphanumerically (with full-screen editing) or by playing the 64's keyboard as a piano.

Its interrupt-driven music files can be added to existing programs. The sample *Allegro* music files (nine with the main program with 44 more on a Sampler disk) are subtle and sophisticated—they are truly musical—and are the best I've ever heard from SID.

Synthy 64 from Abacus was one of the first composition programs on the market. With it, you write music in a

Continued on pg. 122

Other Musical Ways

Guitar Master from MasterSoft is a combination book and disk that teaches you how to play the guitar. The book has 64 self-paced lessons to guide you around eight programs on technique (chord fingering, scales, pick and strum patterns and progressions, for example) as well as theory. On-screen graphics and aural reinforcement by SID are both handled well. **Trumpet Master** is similarly structured.

Music Made Easy from Alfred Publishing Company is a book/disk package that teaches general music theory. It starts from scratch with note placement on both treble and bass staves, and ends with composing and harmonizing a melody in a major key. **Practical Theory**, available in three separate volumes, is the classroom version.

Tune Trivia from Sight & Sound is four music games on one disk. Up to six players are allowed, and there must be a million questions. You can add your own, along with tunes to match.

Auricle: The Film Composer's Time Processor is a utility program for coordinating the split-second timing of music to dramatic action in motion pictures. A MIDI version may be available by the time you read this. MIDI, or Musical Instrument Digital Interface, is a developing software and hardware standard for connecting different kinds of professional music synthesizers and drum machines to a computer. This results in a staggering array of benefits to professional musicians, not the least of which allows live performances with more (and fancier) sounds than players have fingers, and pre-recording things like stage lighting to coordinate with the music. Commodore 64 MIDI interfaces are now available from most

64 Ways to Make Music

Music Port Keyboard
Tech Sketch, Inc.
26 Just Road
Fairfield, NJ 07006
800-526-2514 $149.95

Music Processor
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 29.95

Music Shop
Broderbund
17 Paul Drive
San Rafael, CA 94903
415-479-1170 $ 44.95

Music Studio
Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
800-227-9759 $ 39.95

Music Video Hits (Album)
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 14.95

Music Video Kit
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 39.95

Music Writer-"64"
Double E Electronics
12027 Pacific Street
Omaha, NE 68154
402-334-7870 $ 69.95

MusiCalc I
Waveform, Inc.
1912 Bonita Way
Berkeley, CA 94704
415-841-9866 $ 29.95

MusiCalc II
Waveform, Inc.
1912 Bonita Way
Berkeley, CA 94704
415-841-9866 $ 19.95

MusiCalc III
Waveform, Inc.
1912 Bonita Way
Berkeley, CA 94704
415-841-9866 $ 19.95

Notable Phantom
DesignWare
185 Berry Street
San Francisco, CA 94107
415-546-1866 $ 49.95

Note Pro Bridge
Electronic Labs Indus.
Box 7167
Baltimore, MD 21218
301-366-8138 $ 39.95

Note Pro II
Electronic Labs Indus.
Box 7167
Baltimore, MD 21218
301-366-8138 $ 49.95

On Stage (Song Album)
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 14.95

Police Hitware
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $ 19.95

Practical Theory
Alfred Publishing Co.
P.O. Box 5964
Sherman Oaks, CA 91413
818-995-8811 $ 79.95

RhythmMaster
Melodian, Inc.
115 Broadway, Suite 122
New York, NY 10006
212-406-5163 $ 39.95

Rock Concert (Album)
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 14.95

Rock'N'Rhythm
Spinnaker Software
One Kendall Square
Cambridge, MA 02139
617-494-1200 $ 39.95

Simons' BASIC
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
215-431-9100 $ 34.95

Solid Gold (Song Album)
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $ 14.95

Song Builder
Sequential Circuits
3051 North First St.
San Jose, CA 95134
408-946-5240 $ 39.95

Song Editor
Sequential Circuits
3051 North First St.
San Jose, CA 95134
408-946-5240 $ 39.95

Song Printer
Sequential Circuits
3051 North First St.
San Jose, CA 95134
408-946-5240 $ 39.95

Sound Maker
Sequential Circuits Inc.
3051 North First St.
San Jose, CA 95134
408-946-5240 $ 39.95

Song Writer
Scarborough Systems
55 North Broadway
Tarrytown, NY 10591
914-332-4545 $ 39.95

SoundChaser 64 Keyboard
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $199.00

Springsteen Hitware
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $ 19.95

Studio 64
Entech
P.O. Box 185
Sun Valley, CA 91353
818-768-6646 $ 39.95

Super Music Box
Personal Peripherals
1505 South Green
Longview, TX 75602
214-758-8874 $ 19.95

SuperExpander 64
Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
215-431-9100 $ 29.95

Synthey 64
Abacus Software
P.O. Box 7211
Grand Rapids, MI 49510
616-241-5510 $ 32.95

3001 A Sound Odyssey
Sight & Sound, Inc.
3200 South 166th St.
New Berlin, WI 53151
800-558-0910 $ 39.95

Trumpet Master
MasterSoft
P.O. Box 1027
Bend, OR 97709
503-388-7654 $ 49.95

Tune Trivia
Sight & Sound, Inc.
3200 South 166th Street
New Berlin, WI 53151
800-558-0910 $34.95

Van Halen Hitware
Passport Designs, Inc.
625 Miramontes Street
Half Moon Bay, CA 94019
415-726-0280 $ 19.95

Voice Master
Covox, Inc.
675-D Conger Street
Eugene, OR 97402
503-342-1271 $ 89.95

Web Dimension
Activision, Inc.
2350 Bayshore Frontage Road
Mountain View, CA 94043
800-227-9759 $ 34.95

PICTURES OF Japa

Photos by Dan Gutman

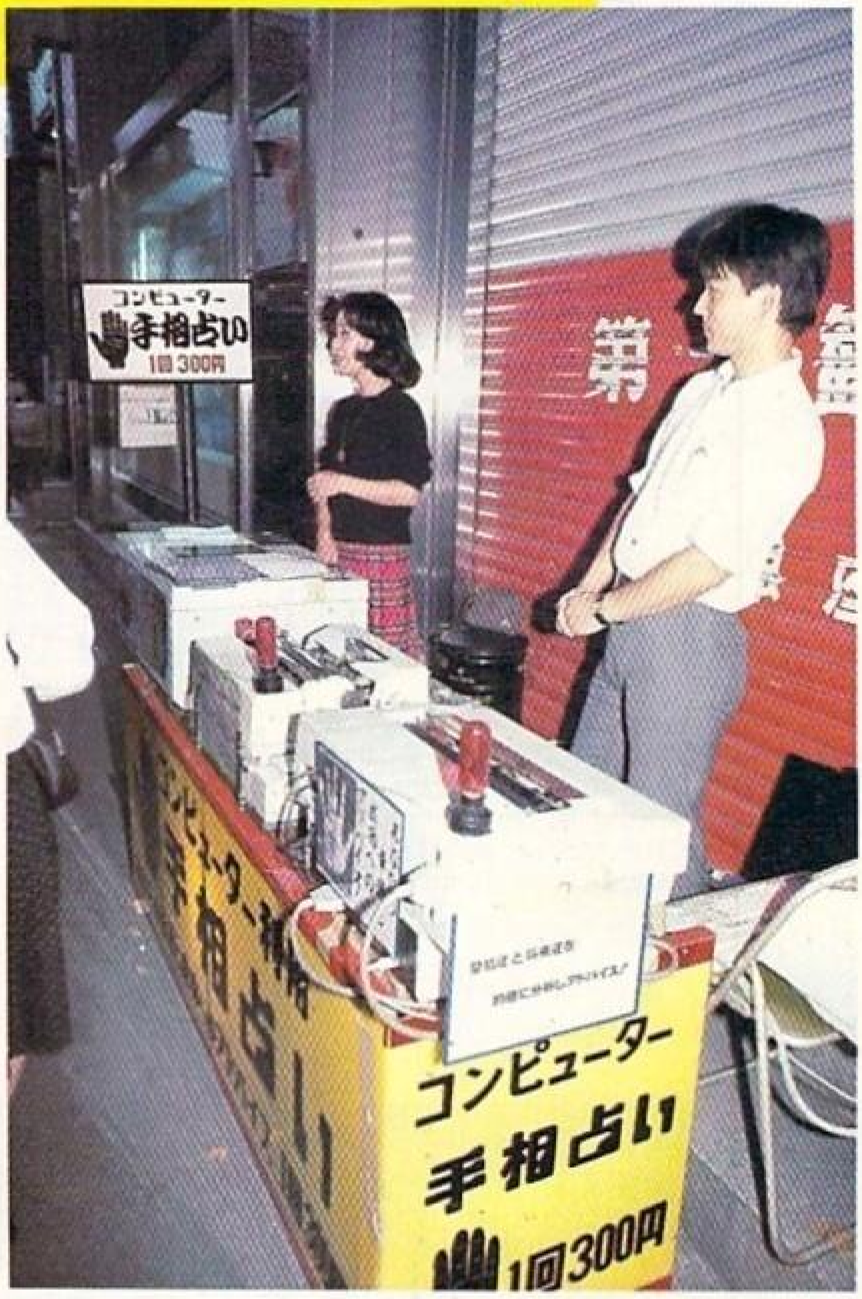
The famous Japanese bullet train. It can travel nearly 150 miles per hour, but it's so smooth you barely notice how fast you're moving. The trains are completely computer-controlled. If you don't get on or off at a stop within four minutes, the doors close and the train just leaves.

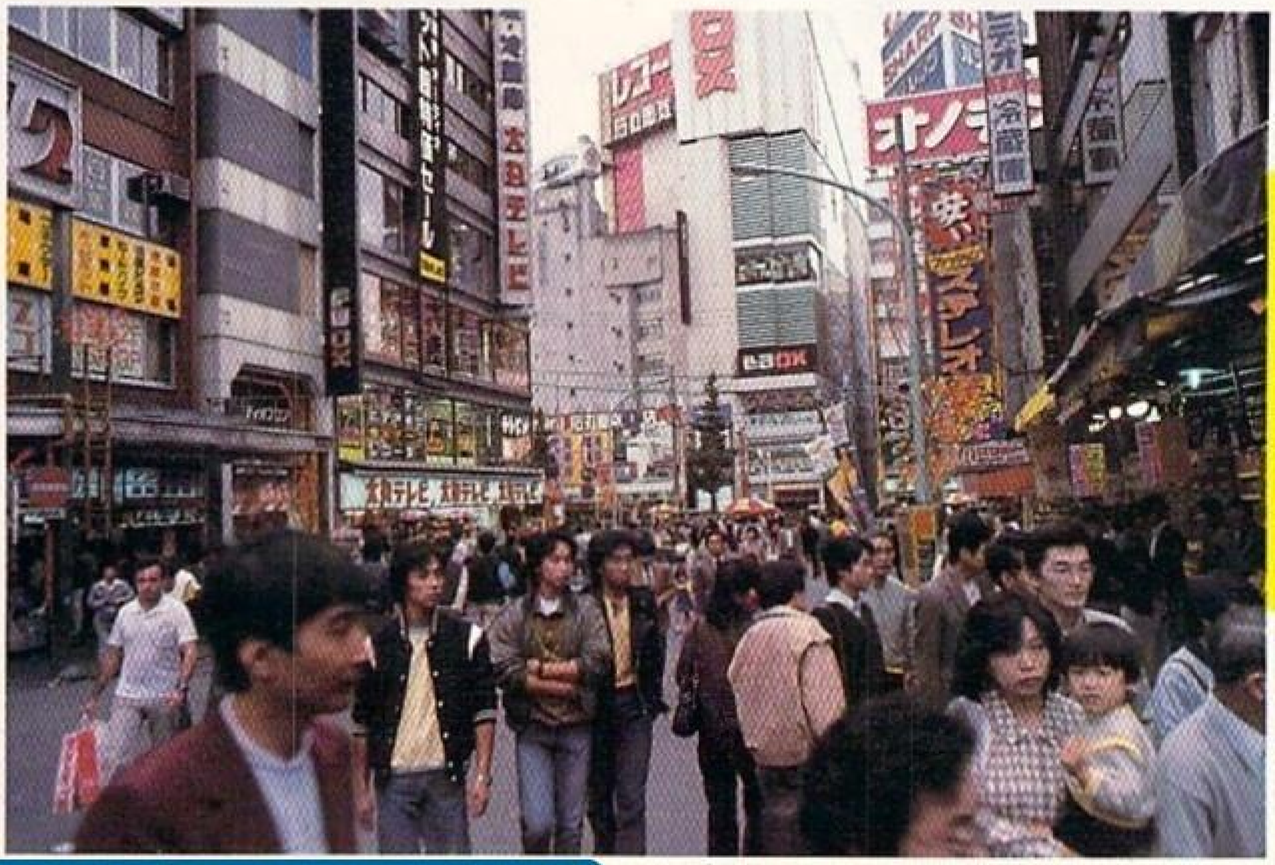
When you think of computers and electronics, you probably think of Japan. Along with the United States, Japan leads the world in computer technology, and we're constantly hearing about "the Japanese invasion" and "fifth generation computers" that will take over in our country—just like the Japanese took over the camera, automobile, video recorder, and television markets.

One of our contributors, Dan Gutman, took a trip to the Far East recently and brought back these photos for us. He found that most of what we hear about high-tech Japan is true. The elevators are speech synthesized, so they call out the floors for you—in Japanese, of course. Nearly all the doors open automatically when you approach them. Even the faucets turn on and off automatically when your hand passes in front of a sensor. The Japanese people love computers and electronics the way Americans love football and barbecues.

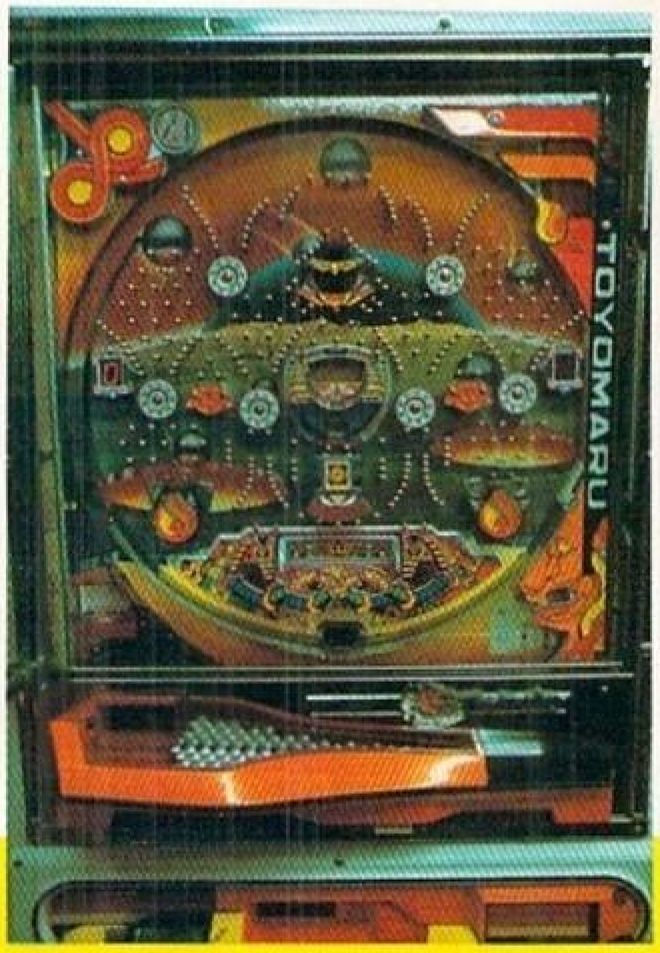
Dan was captivated, not only by the technology of Japan, but also by the people, culture, and customs he found there. The photographs on these pages present just a small fraction of the wonders you would find if you took a trip to Japan. As the computer revolution matures, it might be wise for all of us to get to know a little bit about our technological sister overseas.

On the streets of Japan, you'll see traditional palm readers on the same street as high-tech palm readers. This pair had rigged up a computer to a photocopy machine and a printer. Customers put their hand on the copy machine and the computer would determine an appropriate fortune and print it out. It costs about $2.

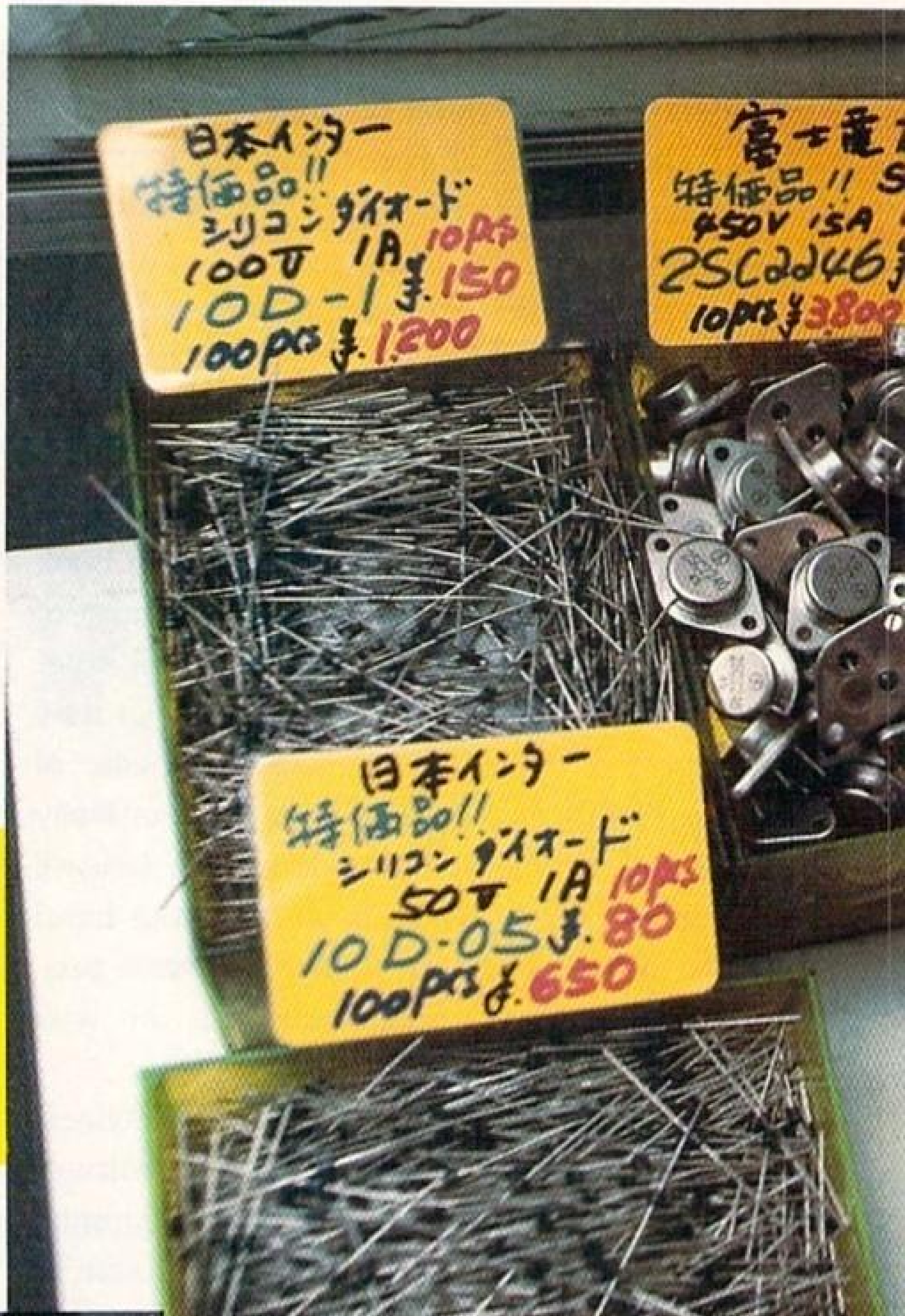

コンピューター
手相占い
1回300円
コンピューター
手相占い
1回300円



Akihabara, or heaven for electronic gadget freaks. This five-block section of Tokyo is lined wall to wall with stores selling computers, VCR's, TV's, air conditioners, cameras, and just about any kind of gizmo you can imagine. They even sell refrigerators and electric garlic presses on the street. On Sundays, the street is closed off to all traffic and it becomes a pedestrian mall.



Pachinko is more popular than computer games in Japan. This game is sort of a cross between pinball and a slot machine. When you drop 100 yen into the slot, those silver balls pour into the tray. You turn a knob and the balls shoot up to the top of the board. They fall down, hitting hundreds of nails along the way. If they fall into certain holes, you win more balls. And so on. Pachinko parlors are all over the streets of Japan.

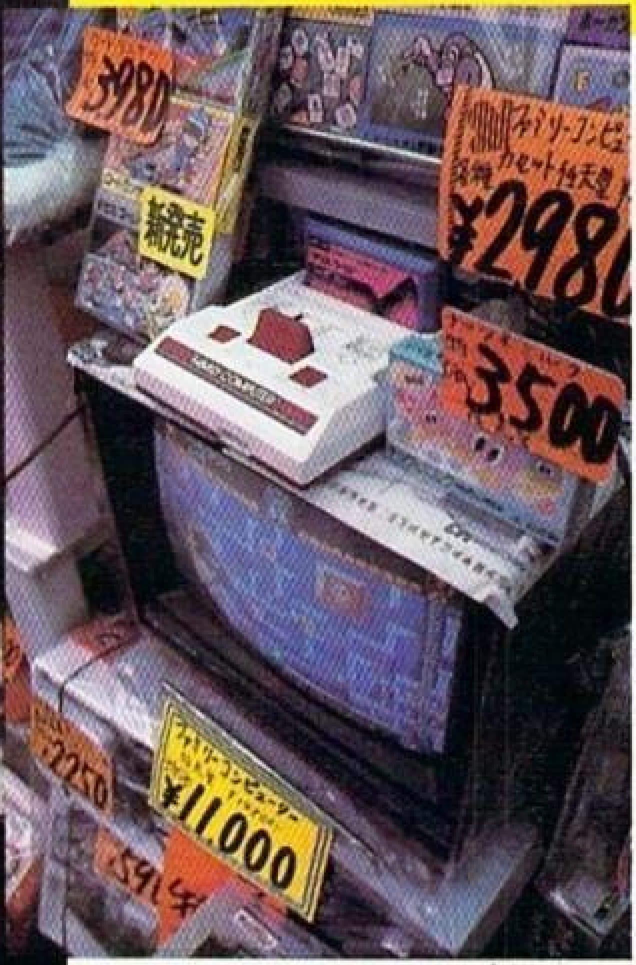

日本インター
特価品!!
シリコンダイオード
100V 1A
10D-1
10pcs ¥150
100pcs ¥1,200
特価品!!
450V 15A
2SC2246
10pcs ¥3800
日本インター
特価品!!
シリコンダイオード
50V 1A
10D-05
10pcs ¥80
100pcs ¥650

Silicon Street. In a section of Tokyo called Akihabara, you can actually buy microprocessors right on the street. This tiny store sold nothing but electronic components.

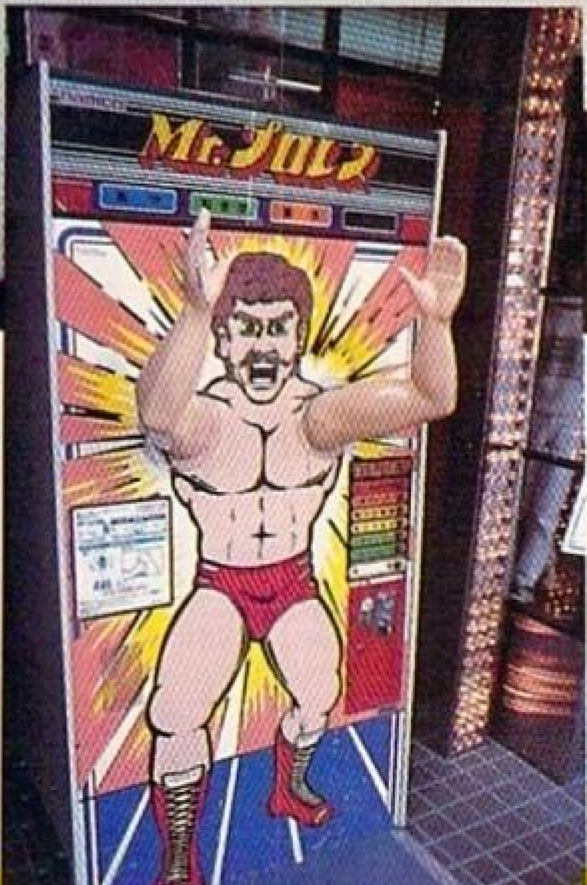
The Japanese are masters at making all sorts of tiny electronic gizmos. It's almost a necessity—there's just not enough room in the country. They've jammed about half the population of the U.S. onto an island the size of California, and most of the land is mountainous. Everything in Japan is smaller, including the people.

TEXAS
特価品!!
ICソケット22PIN
10PCS $.120
SW
2SC2243
10PCS $2800
ICソケット40PIN
Quad-2-Input And Gate
74LS08

Long before the Nintendo Entertainment System was available in the United States, it had captured about 90% of the Japanese market as the "Family Computer." Now it's being sold with a robot. If you want to check the prices, it's about 250 yen to the dollar. Nintendo, by the way, has been in business for about 100 years. The company started out making playing cards.


3980
新発売
¥2980
3500
2250
¥11,000

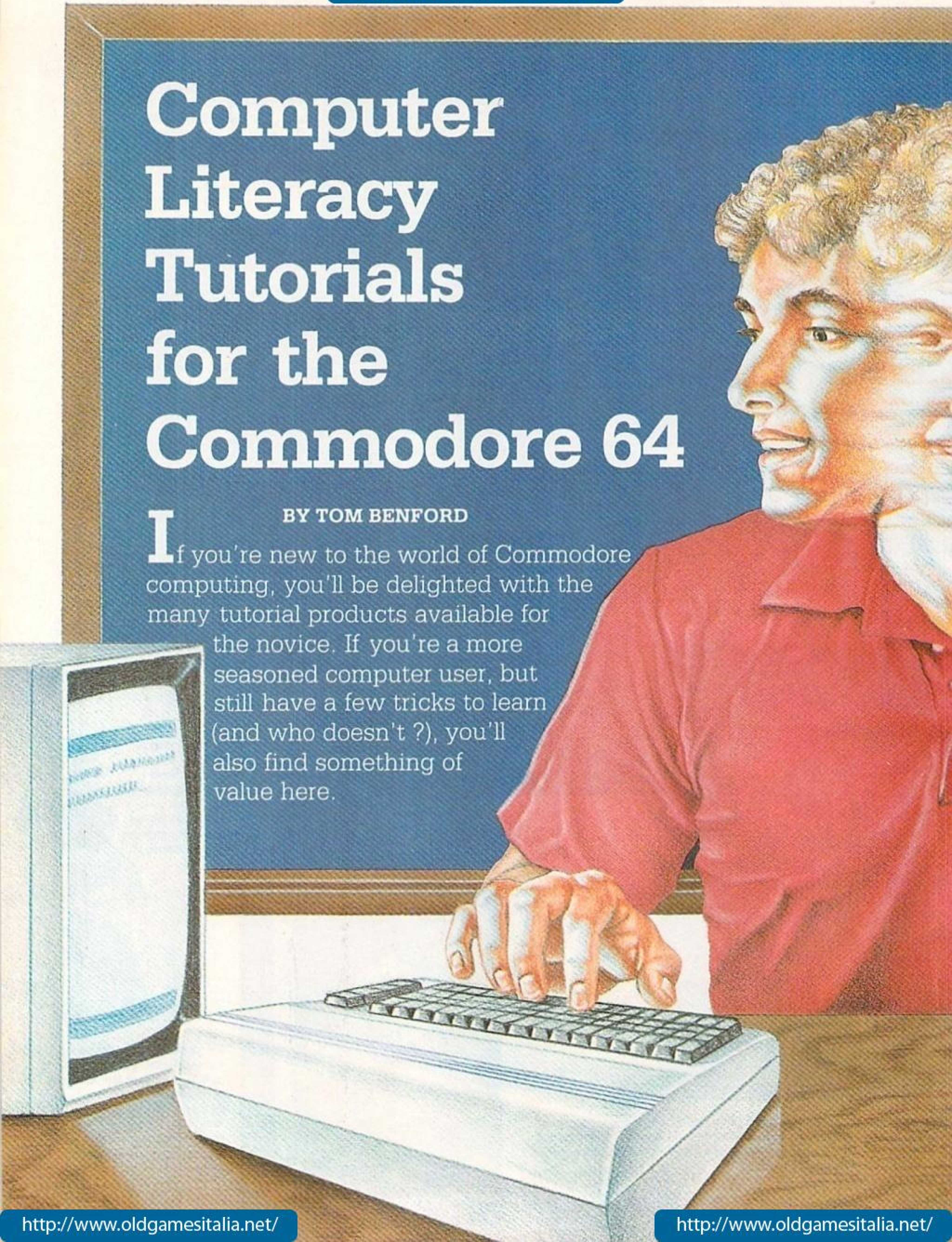
Japan leads the world in robotics. There are robot-controlled factories here that run 24 hours a day in complete darkness making things like vacuum cleaners and other appliances. This fellow was just an amusing attraction that was handing out advertising flyers to children on the street.



The arcades of Japan often have a game outside attracting attention on the street. This very American-looking fellow will arm wrestle with anyone who drops 100 yen in his slot. Notice that both hands are operational, so lefties as well as righties can try their luck.

●前売券お買上げの方に
プレゼント!
ゴーストバスターズ

Who ya gonna call? Japanese culture is very different, but the people are big fans of America too. American movies, music, books, and fashions are usually very popular there. When I was there, the big fad among Japanese teenagers was to wear American high school baseball jackets.



Computer Literacy Tutorials for the Commodore 64

BY TOM BENFORD

If you're new to the world of Commodore computing, you'll be delighted with the many tutorial products available for the novice. If you're a more seasoned computer user, but still have a few tricks to learn (and who doesn't ?), you'll also find something of value here.

One of the nicest things about living in this "electronic age" is the ease and convenience of sharing information. Not too long ago, if you wanted to learn about computers or programming, you were pretty much limited to taking courses or reading books on these subjects. While these are still viable means of learning, you now have other alternatives that allow you to learn at your own pace from the comfort of your own home.

In addition to the wealth of books on using and programming the Commodore 64, you can now also learn these things from audio and videotape courses—and even from disk-based courses using the computer itself as the instructional medium. Thus, computer literacy is easily attained through the marvels of technology.

The main advantage of using a tutorial, regardless of the medium, is that the student can learn at a pace that is comfortable for him or her. If something is covered in the tutorial that you're a little fuzzy or unclear about, it's a simple matter to rewind the tape (or re-read a section) to go over it again. Many people find this to be a boon to comprehension, since it allows them to master each section of the material.

Using a private tutorial package removes the peer pressures often encountered in formal classroom situations. You don't have to feel the least bit embarassed about a wrong answer when the "teacher" is a machine. This factor also enhances comprehension since you can learn at your own pace rather than trying to keep up with the rest of the class. The "instructor," whether it be a cassette player, VCR or the 64 itself, is a teacher with infinite patience.

Tutorials are also convenient. You don't have to rearrange your schedule to fit them in. Whenever it's convenient for you to learn, the tutorial programs will oblige you.

Another big advantage of using a tutorial is that it provides "hands-on" experience. The course material explains the function and (depending on the media) may even demonstrate it. Then it's your turn to try it for yourself. This interactivity between the material and the student provides a positive learning experience.

Now that we've seen the advantages of learning about your Commodore 64 through tutorial programs, let's see what's available.

VIDEO TAPES

Commodore 64-Training Tape
PF Communications
2727 N. Grove Industrial Drive #101
Fresno, CA 93727
(209) 255-1600

> If you're new to computing, I'd suggest joining a user group in your area. They're a great way to learn about computing and have fun at the same time.

Commodore guru Jim Butterfield is the host on this videotape ideally suited to the new owner of a Commodore 64. Jim takes the viewer on a journey that explores the capabilities of the 64 in 14 short sessions.

This tape does not teach programming. Instead, it covers the possible uses and impressive capabilities of the 64. It's particularly useful for acquainting the new user with the machine itself and showcasing the marvelous things that can be done with it. Butterfield starts at the beginning by unpacking a 64 from the carton and hooking it up, explaining what he's doing every step of the way.

The information covered in the 14 sessions includes an explanation of what the Commodore 64 is, how to get started, running programs, explaining how programs work, and putting them to work. Other sessions touch on the subjects of storing information, using the 64 as a learning tool, telecommunications, and programming languages. The tape also lightly covers graphics, music, games and simulations.

Butterfield's style is easy-going and laid-back, just as he is in real life. The program runs just short of two hours total time, and it's an excellent way for a novice to get acquainted with the computer. While it doesn't teach you anything about programming or advanced application functions, it presents the capabilities of the machine in a very understandable form. The video, audio and production standards in general are all very good, and it will provide enjoyable viewing for the whole family. I recommend it for the new user as an entertaining way to get his or her feet wet.

BP-3
(Commodore 64 Basic)
Lynn Computer Service
6831 W. 157th Street
Tinley Park, IL 60477
(312) 429-1915

If you're interested in learning how to program in BASIC, the *BP-3* videotape from Lynn Computer Service is a great way to start. The actual screen display of a Commodore 64 provides the video focal point of the material while a friendly female voice handles the narrative. The material covered in this videotape is quite comprehensive, starting with a tour of the keyboard and going right through some advanced programming techniques.

Total running time for the tape is just short of two hours and it covers a lot of ground in this time. The narrative encourages the user to pause the tape frequently and try out functions or exercises being demonstrated. This interactivity facilitates learning and holds the viewer's interest.

This videocassette serves as an adjunct to the Commodore 64's user manual and provides an excellent introduction to BASIC programming. While the production technique isn't exactly up to "Hollywood" standards, the material contained and the way it is presented make up for it. Lynn Computer Service also has a large selection of other computer tutorial tapes for both the 64 and VIC-20 on mastering several commercial applications software programs.

AUDIO TAPES

How to Operate the Commodore 64
Fliptrack Learning Systems
999 Main Street, Suite 200
Glen Ellyn, IL 60137
(312) 790-1117

This is a mixed-media tutorial program that consists of two audiocassettes, one program cassette, and a quick reference guide. To take full advantage of the material presented in this tutorial, you'll need a datassette recorder, since no disk is supplied with it.

Since the tutorial is presented on audio cassettes, the computer doesn't have to compete with a VCR over use of the television. As with the other programs covered here, you're encouraged to pause frequently and try things out for yourself.

The narrative is of excellent quality, both from production and content standpoints. Lee McFadden, the narrator, starts with a tour of the Commodore 64's keyboard and works his way up through just about every stage of BASIC programming, including music and sprites. It's a thorough tutorial that presents the material in a very palatable form.

In spite of the fact that the sample programs are not available on disk, *How to Operate the Commodore 64* is an excellent tutorial for the novice and I recommend it.

DISK-BASED TUTORIALS

Step-by-Step
Program Design, Inc.
P.O. Box 4779
Greenwich, CT 06830
(203) 661-8799

Step-by-Step foregoes the elementary aspects of setting up the computer and touring the keyboard, since these topics are well covered in the Commodore 64's manual. Instead, this tutorial jumps right in and starts teaching you programming in BASIC.

Step-by-Step is supplied on disk along with a comprehensive "course" manual (a cassette version is also available). Comprehensive is a good word to use here, since the tutorial goes into great depth and provides a wealth of information—even explaining the differences between machine-language and BASIC programming.

The course material is in the form of lessons, and each lesson is divided into "frames" (a frame is simply a

You can now learn to use and program your Commodore 64 from audio and videotape courses—and even from disk-based courses using the computer itself as the instructional medium.

screenful of information). Quizzes are included at the end of the manual so that you may check your comprehension and progress as you proceed. I particularly like this feature, since it lets you isolate problem areas and devote further attention to them. Of course, the correct answers are also provided to help you grade your performance.

The material is presented in a straightforward and logical manner. Such topics as loops, integers and other functions and statements are illustrated generously with example programs.

This is an excellent BASIC tutorial package that should have you writing your own "bug-free" programs in very short order. It doesn't get into complex graphics, sprite or music functions, but it does provide a good foundation on the basics of BASIC. Additionally, Program Design, Inc. has a number of other tutorial programs which pick up where *Step-by-Step* leaves off.

I Am the C-64
Creative Software
960 Hamlin Court
Sunnyvale, CA 94089
(408) 745-1655

If you're a person who doesn't like to read manuals, you'll like this tutorial. All of the necessary text is included on the computer's video display and, consequently, no manual is supplied with the disk.

While *I Am the C-64* will provide a good foundation in BASIC programming for users of all ages, this package is particularly well suited to the youngster. Lavish use of graphics, animation and sound will hold the user's attention and keep his or her interest level high.

The course is presented in a series of six lessons, each taking about ten minutes to complete. A double-sided diskette is used, which has lessons one to three on the "A" side and four to six on the "B" side. A provision has been included to back up and review previous screens, should the user desire to do so.

The lessons include an overall introduction to the Commodore 64, an introduction to the keyboard, and an introduction to BASIC on the "A" side. The "B" side takes you through advanced BASIC functions, sprite graphics and music/sound synthesis.

This package won't make you a BASIC programming whiz, but it will get you off to a good start. The material is presented in a highly entertaining and interesting format. This package is likely to find favor among younger novice programmers.

CodePro-64
Systems Management Associates
3700 Computer Drive
P.O. Box 20025
Raleigh, NC 27619
(919) 787-7703

Book Learning for the Commodore 64

BY JOYCE WORLEY KATZ

Even computer novices with cold feet feel comfortable learning from books. Not only that, but books are compact and portable, making them the most convenient computer tutors available. And there's certainly no shortage of volumes that teach new Commodore owners how to use their equipment. To help you get started, here is a brief list of recommended reading.

Commodore 64 User's Handbook, by Weber Systems, Inc. Staff (Ballantine, $9.95), is an excellent manual that provides everything the Commodore 64 user needs from the moment the machine is taken from its carton. It describes exactly how to install the computer, disk drive or cassette recorder, printer and modem, using either a monitor or T.V. set, then gives a key-by-key introduction to the equipment's operation. About a third of the book is devoted to BASIC programming, with a special section that unveils the Commodore 64's sound and graphics capabilities. It's written on a high school or adult level, with some computer jargon, but there's a glossary at the back of the book to clear up most questions. Each section provides sample programs so readers can test the theories they've learned. Although it's not a step-by-step programming guide, it does provide a solid background in programming to get the user started. At the same time, it's an excellent hardware guide for Commodore users, including technical details and troubleshooting information to help keep the equipment running properly.

Using the Commodore 64, by Len Lyons with Joe Campbell and Herb Moore (Addison-Wesley, $14.95), is a step-by-step guide to the keyboard, disk drive, cassette recorder and printer. It carries the new owner through keyboard exercises and simple programming routines, using straightforward, uncomplicated language. It explains the reasoning behind each entry so learners understand why the computer works as it does, rather than simply having them memorize functions. Half the book is devoted to special applications, including detailed instructions on using word processing, financial management, record keeping and telecommunications, as well as games and educational programs. This is an excellent text for beginners. The uncomplicated language and careful explanations make it especially helpful for Commodore users of all ages.

Len Lyons penned yet another volume, this one to help computerists become versed in telecomputing. **The Commodore 64 Connection** (Addison-Wesley, $16.95) discusses the necessary hardware for telecommunications, including suggestions for how to choose the right modem, then explains how to hook up and use the VICMODEM and Commodore's AutoModem. It also demystifies baud rates and smart software. The book gives a comprehensive explanation of what telecommunications can provide to users, and discusses the specific services the Commodore owner can tap, such as CompuServe, The Source, Dow Jones News, On-line Shopping, and computerized bulletin boards. It's just the helpful material needed for any user planning to go on-line.

Kids To Kids On The Commodore 64, by Sam Edge, Billy Sanders and Kris Hauser (Datamost, $9.95) is especially for the young set. In simple language, it teaches children to use the equipment, then guides them through simple BASIC programming instructions. Children learn to write their own games by following tutorials that make the process completely clear. The simplicity of the lessons makes *Kids To Kids* ideal for youthful computer users, but also appealing for older adults who'd like to learn the basics in easy steps.

Computer Playground by M.J. Winter (Datamost, $9.95) is another book for youngsters, but this is aimed at children in grades two through six. It contains a collection of BASIC activities presented as problems in a workbook format. Children type and run sample programs, modify them, even complete partially written programs, while learning key BASIC commands. The language is very easy, and the book is illustrated with cartoons and pictures for the child to color.

BASIC Is Child's Play, by Robert Grauer, Judy Gordon and Marsha Schemel (Prentice-Hall, $14.95), is for grammar school kids and their parents. It requires no background knowledge and encourages the reader to participate by actually handling the computer. The programming examples are tied to elementary school subjects. This is a non-threatening, but slightly more serious book for youngsters who'll be studying with parental or classroom help.

Commodore 64 BASIC Programming, by Peter Holmes and Derek Bush (Hayden, $29.95), is a book and software package containing one disk and a 300-page text that teach adults to create programs with sound, graphics and music. It explains the fundamental commands and utilities in a primary computing lesson that prepares users for BASIC programming. The disk contains games, utility programs, and a learning program that accompanies the explanations in the book.

The same pair of authors wrote **Commodore 64 Assembly Language Programming** (Hayden, $29.95). Another software/book combination, this self-paced course guides adult beginners through assembly language programming. The software complements the book, providing exercises based on the text lessons. It also contains a full-featured assembler and a binary-hexadecimal conversion tutor. Computerists who master these lessons learn the essentials of assembly language programming, including branching, screen display, addressing modes, interrupts, macro instructions, floating-point calculations, and the 64's built-in subroutines.

Commodore 64 Color Graphics: An Advanced Guide, by Shaffer & Shaffer Applied Research & Development (Arrays, $14.95), is for programmers who have learned the primary lessons and are ready for something a little more difficult. The book gives specific instructions to help programmers develop high-speed graphic routines just like the professionals write. Although not as easy to follow as the tutorials written for children or new computer owners, this book presents a lot of meat for more advanced student programmers.

Computerists who already can program in BASIC will enjoy **Dr. C. Wacko's Miracle Guide to Designing & Programming Your Own Commodore Computer Arcade Games**, by David Heller and John Johnson (Addison-Wesley, $12.95). It's filled with helpful hints to let programmers write games. There are specific routines included to design playing fields, characters, sounds and animation sequences. Although the book does presume advance programming knowledge, it's a good step-by-step guide to take a new programmer to near-professional levels. It's also available as a book/software package for $29.95. The disk contains the book's programs in a ready-to-run format.

Here's a heavy-duty tutorial that really gets into things. In addition to providing a complete BASIC language tutorial, it also includes a music editor/generator, music programming demonstrator, sprite editor/generator, and sprite programming demonstrator. This material is further explained in an excellent reference manual. Since the tutorial is entirely menu-driven, using it is really simple.

Included on the tutorial disks are several demonstration programs that illustrate how commands and statements affect program operation. The material is presented in an easy-to-understand format, but it takes more of a "no-nonsense" approach than some other products covered here. It is therefore, probably better suited for teen-aged and older users than for youngsters.

CodePro-64 provides an excellent introduction to BASIC, but it goes quite a bit further than that. Even seasoned programmers will find the sections on sprites and music to be valuable. It's quite evident that much planning and forethought went into creating this highly useful and comprehensive tutorial package.

I recommend this tutorial especially to those users who are seriously interested in learning about BASIC programming, music and sprites on the 64. If you fit that description, this package is what you're looking for.

Step One
Whiz Kids Educational Computer Centres, Inc.

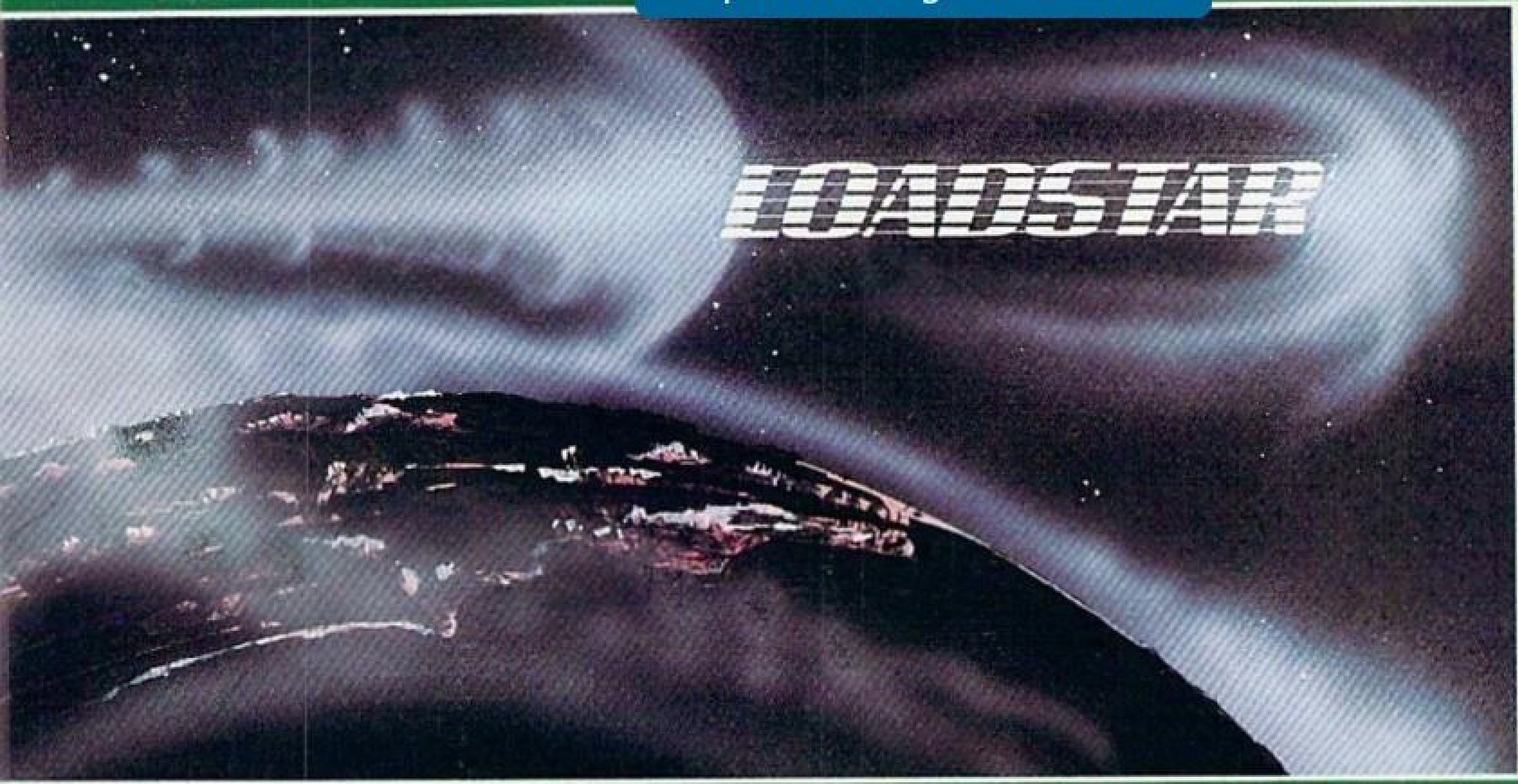
28-238 Davenport Road
Toronto, Ontario M5R 1J6
Canada
(416) 789-1770

Here's another excellent disk-based tutorial, which claims to be "The Complete Computer Course," and I'm inclined to agree with that statement. It touches on just about every aspect of computing with a Commodore 64.

BASIC programming is covered in great depth by *Step One*. An excellent manual provides the bulk of text and related information, while the disk contains example programs and exercises. The combination of the two adds up to a superb home-study tutorial.

Educational games are also pro-

Continued on page 126



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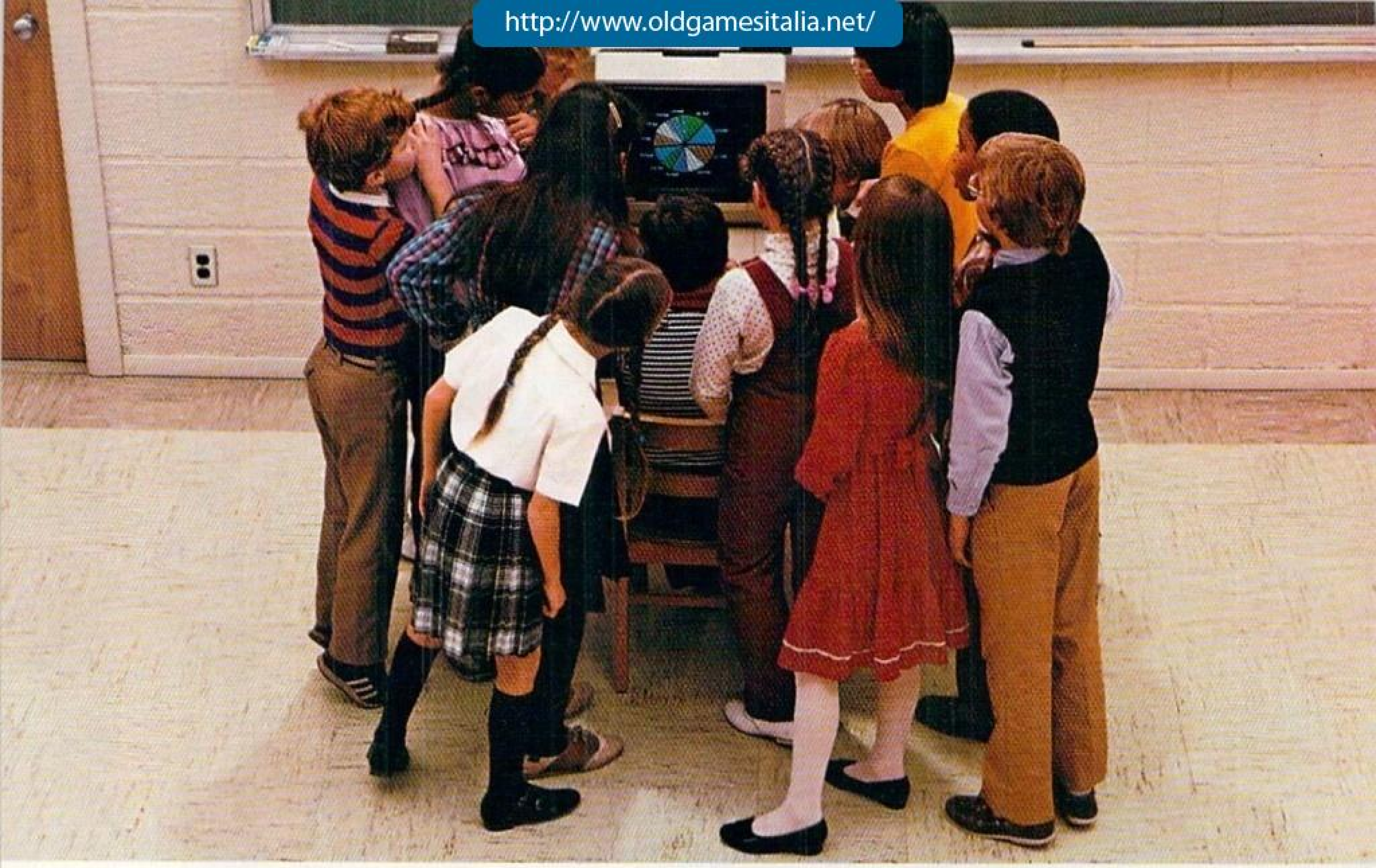
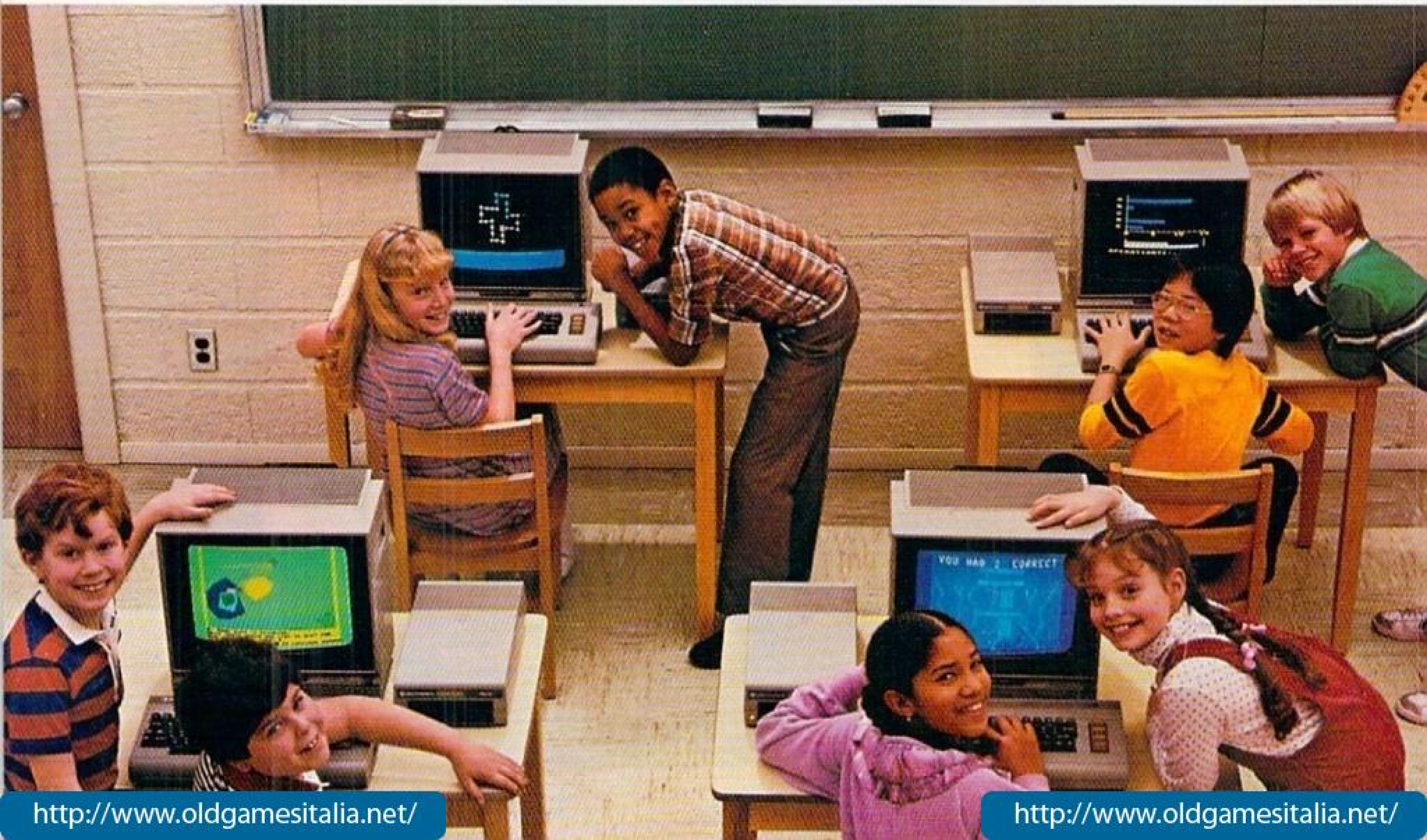


WHY THE COMMODORE 64 ISN'T IN A CLASS BY ITSELF.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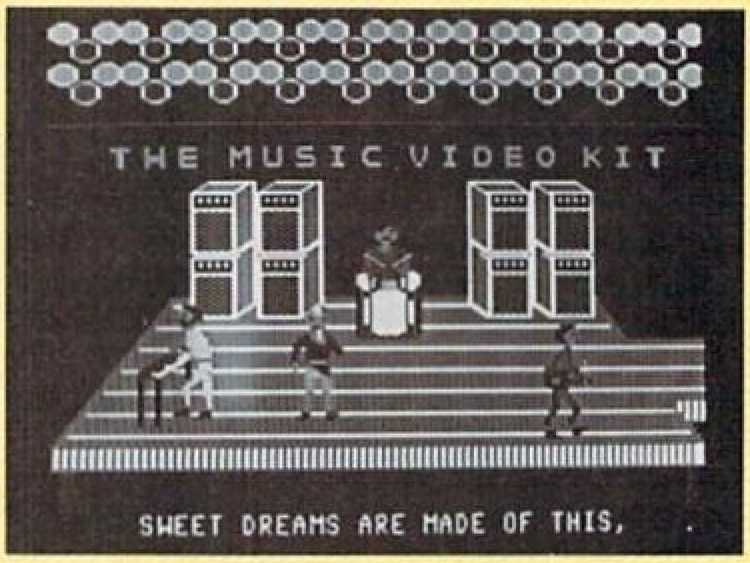
REVIEWED BY JAIME WILCUTTS

Music Video Kit

Computer: Commodore 64
Publisher: Sight & Sound
3200 S. 166th Street
New Berlin, WI 53151
Medium: Disk
Price: $49.95

If you want to create animation with music, Music Video Kit *will give you the tools to go the distance.*



Music Video Kit, designed by Peter Engelbrite and produced by Sight & Sound, uses the video magic of the Commodore 64 in conjunction with its music capability. Be entertained by the performances included in *Music Video Kit*, or create your own.

There are several performances included that give you an idea of the program's potential. It is important to realize that what you see here is what you can actually create.

The Program

In Create Video, choose the background, actors, and music to be used. *Music Video Kit* comes with over 25 different backgrounds from a "Rock Stage" to "Ancient Ruins," some 60 different actors, including spaceships, punk rockers, and over 15 pieces of music, from "Sweet Dreams" to a Bach fugue from "The Well Tempered Clavier."

Each actor's movements are recorded separately with a joystick, much like making a multi-track audio recording. There are a variety of actions produced with the joystick—make the actors disappear, move them behind the background, and change colors.

The Graphics Editor creates backgrounds and actors, or edits background and actors already created. However, before you go ahead and try to design your own actor, follow the example in the documentation. The documentation leads you through the creation and illustrates how to animate your actor so it responds to the joystick. There are 128 possible "shapes" per actor. Combining these shapes in a sequence creates animation. As the actor is created and animated, a "texted" is compiled and stored in the graphics language, BASM.

To actually create an actor or background, you are given a menu. Before you begin to draw, make sure you delete what is in memory. With the background memory cleared, use the Draw Background option of the menu. Again, start by following the documentation, which will familiarize you with the commands. A help screen is available and will appear as soon as you enter the draw mode.

Whereas the actors are made up of "shapes," the backgrounds are composed of a series of characters. Each character is eight-by-eight pixels. Move between the character editor and the background screen, placing your "characters" on the screen with the joystick. One problem does occur, however, when you try to use the paint command. The manual indicates you press "P" and move the cursor through the area you wish to paint. You will find that the "P" is actually the print command. Painting is accomplished using a filled-in "character" in the color of your choice.

As you create your characters, you will notice at the bottom of the screen a grouping of characters that you previously created. This group is called a "prop." Using several props to create a grove of trees is far less tedious than placing individual characters. Any repeated object or background pattern is much easier to draw using the props.

The documentation will take you into more advanced background modes. Once familiar with these, your imagination can fly, and you can create interesting backgrounds no matter what your skill level.

After you create your actors and backgrounds, the text can be saved to disk. This text uses the graphics language and can be accessed in either the actor or background modes. Now edit your creations. The documentation includes explanations of the functions and commands of the graphics language, and editing is accomplished the same way one edits a BASIC program. This feature is a great strength and makes the program transparent. You don't need to search for the "secrets."

Music Video Kit does not contain the same editing and creation capacity for music as it does for actors and backgrounds. However, Sight & Sound has another program called *Music Processor* which is completely compatible with the *Music Video Kit*. The *Music Processor*, used with *Music Video Kit*, gives you total control over both sound and visuals.

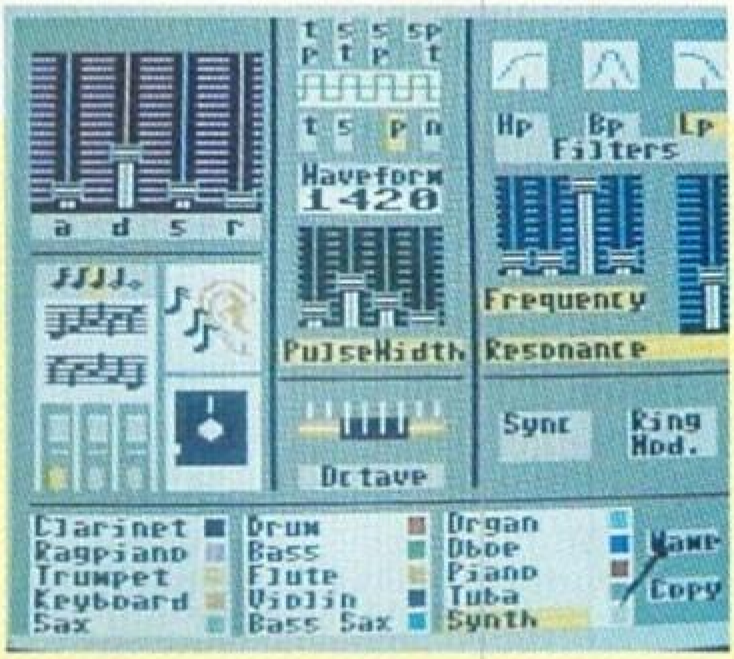
Now that the background, actors, and music have been stored on disk, you can go back to the main menu of the graphics editor and load the "performer" part of the program. Create your own performance the same way you created your backgrounds, actors, and music. First load them, then record the performance and save it. You now have an original work.

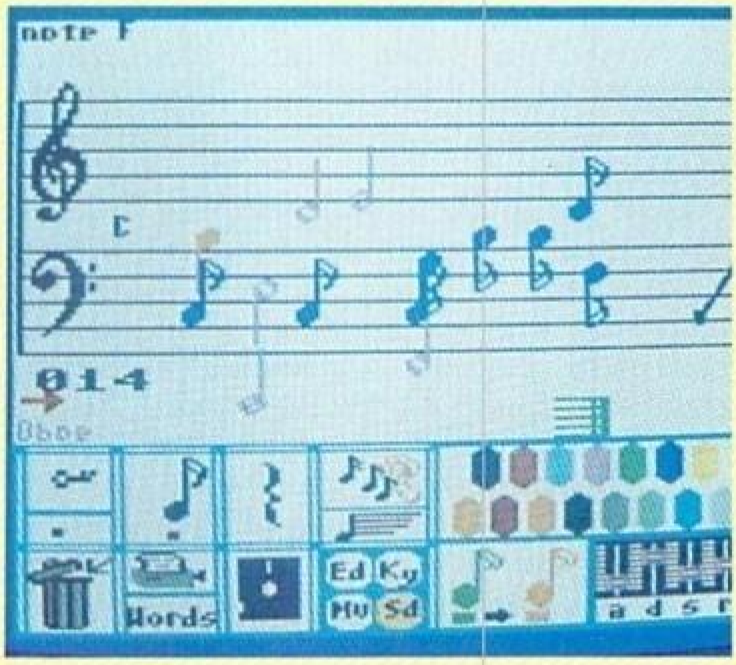
Music Video Kit has a suggested retail price of $49.95 and is well worth it. *Music Processor* retails for $34.95. (This program is being updated to include a music printing program.) If you want to create animation with music, *Music Video Kit* will give you all the tools to go the distance. ■

REVIEWED BY TED SALAMONE

The Music Studio

Computer: Commodore 64
Publisher: Activision
2350 Bayshore
Frontage Rd.
Mountain View, CA
94043
Medium: Disk
Price: $29.95





> *Long after you learn the basics,* The Music Studio *will surprise you with subtleties and nuances to further unleash your creative juices.*

Similar to the format used by Commodore's *Magic Desk*, *The Music Studio*'s option selection is made using icons and the joystick. To hear, move the on-screen marker to the ear icon and hit the button. Tired of that piece? Move the marker to the trash can icon, press the button, and the composition is history.

The Music Studio is composed of two sections: the Paintbox and the Music Editor. Get your experience in the Paintbox mode, then move on to the full-blown features of the Music Editor. View it as an easy way to get acquainted with the program, or with music in general.

The main Music Editor screen contains a double staff and icons for placement of notes (32nds must have been on vacation when the code was written), accidentals (sharps, flats and naturals), rests, and the means to create triplets or extend the value of any note by one half.

There's also a wild "words" option for the addition or alteration of lyrics, and a printer icon for creation of sheet music. Then, of course, there's the ubiquitous File 13 (trash can) for those times when Murphy's Law strikes again.

By depressing the fire button while the pointer is on the ADSR (attack/decay/sustain/release) symbol, you're transported to the waveform creation and manipulation screen. From here, you can access canned sound effects. Better yet, create original effects. Name them, then assign each one a color for palette identification. This works equally well when you are changing the pre-supplied instrument voices.

Composers can vary frequencies, set the filters (three) individually, and select from sync and ring modulation features. Or write in up to three instruments simultaneously.

Budding Beethovens may play the scale repeatedly as they vary the selected parameters. Change octaves, set pulse width, or address each of the ADSR functions. Most of these features are altered through horizontally or vertically sliding bars, just like stereo equipment.

Moving the pointer off-screen (bottom edge only) and pressing the fire button returns you to the previous screen. You can then access the edit function where columns can be inserted, deleted, copied, or moved. Entire blocks may also be moved or copied.

Invoking the Key option changes keys, alters (en masse) the value of notes already placed, and transposes the entire composition to another key.

Music Mode sets the playing speed (slide adjustments replace standard notation here, too), goes to the beginning or end of a composition, or scrolls through the music five columns at a time. This is also the place to tie notes together, set playback volume, and insert repeats and measure bars.

Access Sound and select the active instrument(s), change the instrument box (like switching colors in a box of crayons), or address the ADSR envelope features. The choice of pre-set instruments includes clarinet, rag piano, trumpet, sax, bass sax, flute, drums, and violin.

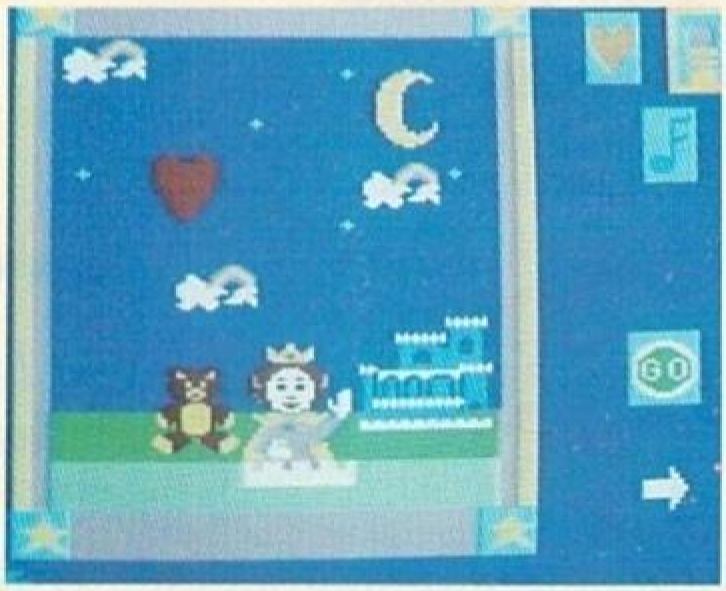
The Music Studio is a powerful, yet uncomplicated program. Long after you learn the basics, it will surprise you with subtleties and nuances to further unleash your creative juices. Best of all, you don't have to be a serious musician to enjoy *The Music Studio*. I recommend it to anyone looking for an easy way to unlock the SID chip's hidden capabilities. C

REVIEWED BY TOM BENFORD

Many Ways to Say I Love You

Computer: Commodore 64
Publisher: CBS Software
One Fawcett Place
Greenwich, CT 06836
Medium: Disk
Price: $29.95

Children can create electronic greeting cards to share with friends and relatives.



Turn your Commodore 64, 1541 disk drive, and monitor or TV screen into a passport to the kingdom of make believe. The result of the collaborative efforts of Family Communications, Looking Glass Software, and CBS Software, *Many Ways to Say I Love You* is intended for youngsters aged four and up.

Most people are familiar with Fred Rogers, the star of "Mr. Rogers' Neighborhood." In his award-winning PBS-TV series, he takes youngsters on excursions into make-believe situations. There, amid pleasant scenarios, he expands communication skills, provides them with creative opportunities, and encourages self-expression. Based on a "Mr. Rogers" orientation, *Many Ways to Say I Love You* provides similar opportunities using the 64. The program aids children in creating electronic greeting cards to share with friends and relatives. Additionally, these expressive creations may be stored on disk to be recalled for enjoyment at any time.

Many Ways to Say I Love You has two skill levels. Level one contains the features that do not require text, such as crayon and stickers. Since no reading is required to operate in this mode, it is ideal for the pre-literate youngster. Level two contains the remaining program features, including text for word messages. With the exception of "custom" text, all other program controls and features are implemented by the function keys, the spacebar, and the RETURN key.

A handy function-key template is supplied with the program disk, because the function keys are used for directional control. The directions are indicated by arrows on the template, so reading ability isn't necessary here, either. This is a superb control layout for youngsters (and parents) alike; everything is logical, direct and simple—just the way it should be.

The graphics, animation, play mechanics, and overall ambiance of the program are excellent, and the music is outstanding. Three themes from the television show are provided, including "There Are Many Ways to Say I Love You," 'Won't You Be My Neighbor?" and "It"s Such a Good Feeling," in addition to "Frere Jacques," "Twinkle, Twinkle Little Star," and "Brahms' Lullaby."

Some words of praise are in order here for the outstanding documentation. In addition to clearly telling you what the controls are and what they do, illustrations augment the text to help youngsters along. Combined with the great control mechanics I mentioned earlier, this manual makes the program easy to use, even for the very young child.

Also included in the manual is "A Message From Mr. Rogers," in which Mr. Rogers explains to youngsters how the program was developed. Pictures of the programming personnel involved are included. This message is written in a true-to-TV Mr. Rogers narrative style. It's a nice touch that works very well.

Many Ways to Say I Love You is entirely menu-driven. The menus use symbolic representations (icons) of their functions, rather than words. Icons such as a crayon (for drawing) and a musical note (for adding music to the card) help the child to develop deductive reasoning and logic skills.

The more I read the manual and played with the program, the more I liked it. It's one of those rare pieces of educational software that keeps getting better as you use it. The only feature that it doesn't have is the capability to print out the finished card on a printer. Of course, the animation and music make up for this, but a hard copy of the creation might have been a really nice touch.

The program provides choices for backgrounds, borders, adding or erasing "stickers" (designs), including word messages, creating music, drawing your own block designs, or animating your "stickers." When the creation is finished, you can save it to disk, throw it away in the trash can, or deliver it. Throwing it away, represented by a trash can icon, clears the screen and takes you back to the beginning. Saving to disk allows you to give the greeting card a file name and call it back in the future.

Delivering a card is the real fun part of *Many Ways to Say I Love You*. When this option is selected, the screen clears, a curtain goes up, and the well known Mr. Rogers' Trolley travels across the screen delivering the card, while the equally well known "trolley" music plays in the background. Any stickers that were animated during the creation, as well as any music that was selected become active at this point, and the card is displayed in all its glory.

Overall, this program provides excellent educational and entertainment opportunities. Giving it to a youngster is another one of the many ways to say "I love you" to that special young person in your neighborhood. ◼

BY JERRY A. STURDIVANT

Circles for the Commodore 128

This program plays with the BASIC 7.0 word CIRCLE. The word CIRCLE does a lot more than just draw circles. If you change variables, you can make ovals, polygons, rectangles, squares, triangles and straight lines. This colorful and eye-pleasing program makes designs by changing, at random, the combinations of possible variables with the CIRCLE statement.

The word CIRCLE contains nine possible variables. In this program, on line 200, we use only six. The first two, X and Y, are coordinates for the center of the circle. The next two, XR and YR, are for the X and Y radius of the circle.

This program doesn't use the next two possible variations in a CIRCLE statement. These variables determine what part of the circle appears and disappears, and are used for making arcs or partial circles.

The next variable, I, is the degree of rotation. We can draw a vertical oval by making XR (the X radius) smaller than YR. Then we can tip the oval to the right 45 degrees by making the variable I a 45.

The last variable, A, is a tricky one. This variable determines the number of degrees between segments. The bigger the number, the farther the straight line goes before turning to form the circle. If A were 90, we would make a square or parallelogram. If A were 60, we would have a six-sided figure. If you use other numbers, you can have sides of odd lengths. The normal default is two degrees.

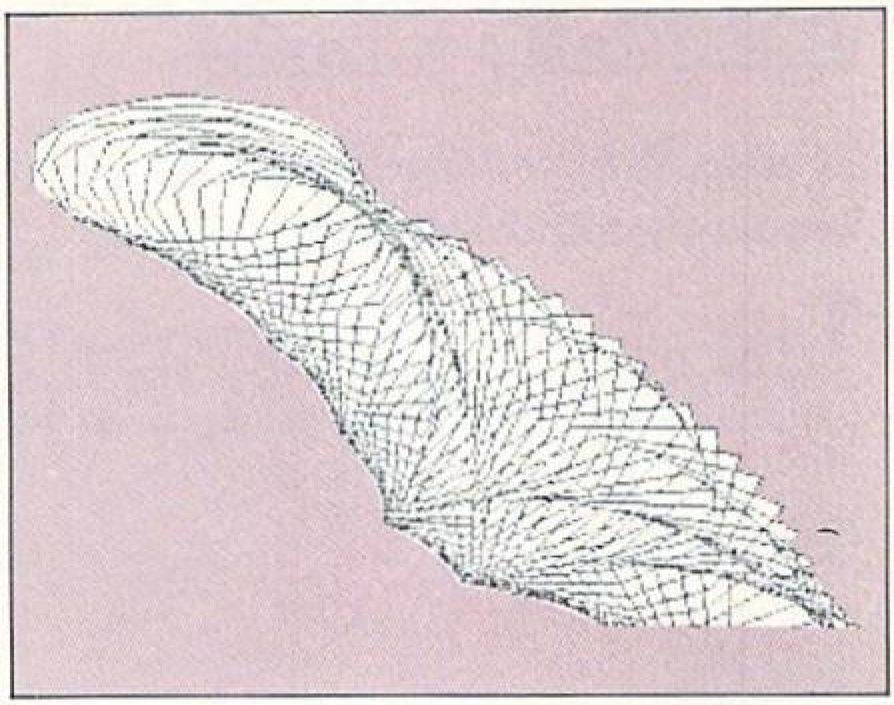
Line 30 sets the background color to blue-green. Line 40 makes the random numbers. Then we enter the DO/LOOP. Between the beginning of the DO/LOOP and the FOR/NEXT loop on line 190, we make our random numbers.

Variable N will be the size of the FOR/NEXT loop. It will be between 100 and 400. The STEP size of the loop, S, will be between three and nine. The B, an "extra" variable, will be a binary number—a one or zero. The "degree before angle" is held in D. I wished to favor smaller numbers, so a random number is picked between 1 and 245. Then a random number is picked between one and that number. This makes just occasional large numbers. The color will be held in C. I have left out colors I considered undesirable.

Now we pick the X and Y coordinates for the circle. I didn't want to start a circle on the edge of the screen so the center will be at least ten in from the edges of the screen. The radiuses XR and YR will be picked so the first circle will not go off the screen. This is calculated from the X and Y coordinates for the center.

Line 160 will toss out any figure that is going to be too small. Line 170 throws out any circle that is too round. Then we go to the FOR/NEXT loop.

Lines 210 to 270 make the changes in the CIRCLE command's variables. Line 210 makes the "degree before new angle" change. The next four lines see where the circle started and whether the figure should move toward the center of the screen. The next two lines, 260 and 270, check to see if our figure is going out of bounds. Line 280 will let us exit the program with a touch of the space bar.



Circles

```
20 TRAP 340
30 COLOR 0,13:COLOR 4,13
40 DEF FN R(X)=INT(X*RND(1)+1)
50 DO
60 N=FN R(300)+100
70 S=FN R(7)+2
80 B=FN R(2)-1
90 D=FN R(FN R(245))
100 C=FN R(10):IF C=6 THEN 100
110 X=FN R(300)+10:HX=X
120 Y=FN R(180)+10:HY=Y
130 XR=FN R(160+(X-150)*(X>=160)+
    (170-X)*(X<=160))+10
140 YR=FN R(100+(Y-90)*(Y>=100)+
    (110-Y)*(Y<=100))+10
150 COLOR 1,C
160 IF XR+YR<45 THEN LOOP
170 IF ABS(XR-YR) <5 THEN LOOP
180 GRAPHIC 1,1
190 FOR I=1 TO N STEP S
200 CIRCLE,X,Y,XR,YR,,,I,D
210 D=D+B:IF D>245 THEN D=245
220 IF HX<110 THEN X=X+2+2*B
230 IF HX>210 THEN X=X-2-2*B
240 IF HY>130 THEN Y=Y-2-2*B
250 IF HY<70 THEN Y=Y+2+2*B
260 IF Y>230 OR Y<0 THEN 300
270 IF X>350 OR X<0 THEN 300
280 GET A$:IF A$<>""THEN EXIT
290 NEXT
300 SLEEP 1
310 LOOP
320 GRAPHIC 0:COLOR 0,7
330 STOP
340 RUN
```

END

BY BRUCE JAEGER

BASICally Simple

How well do you know your BASIC keywords and commands?

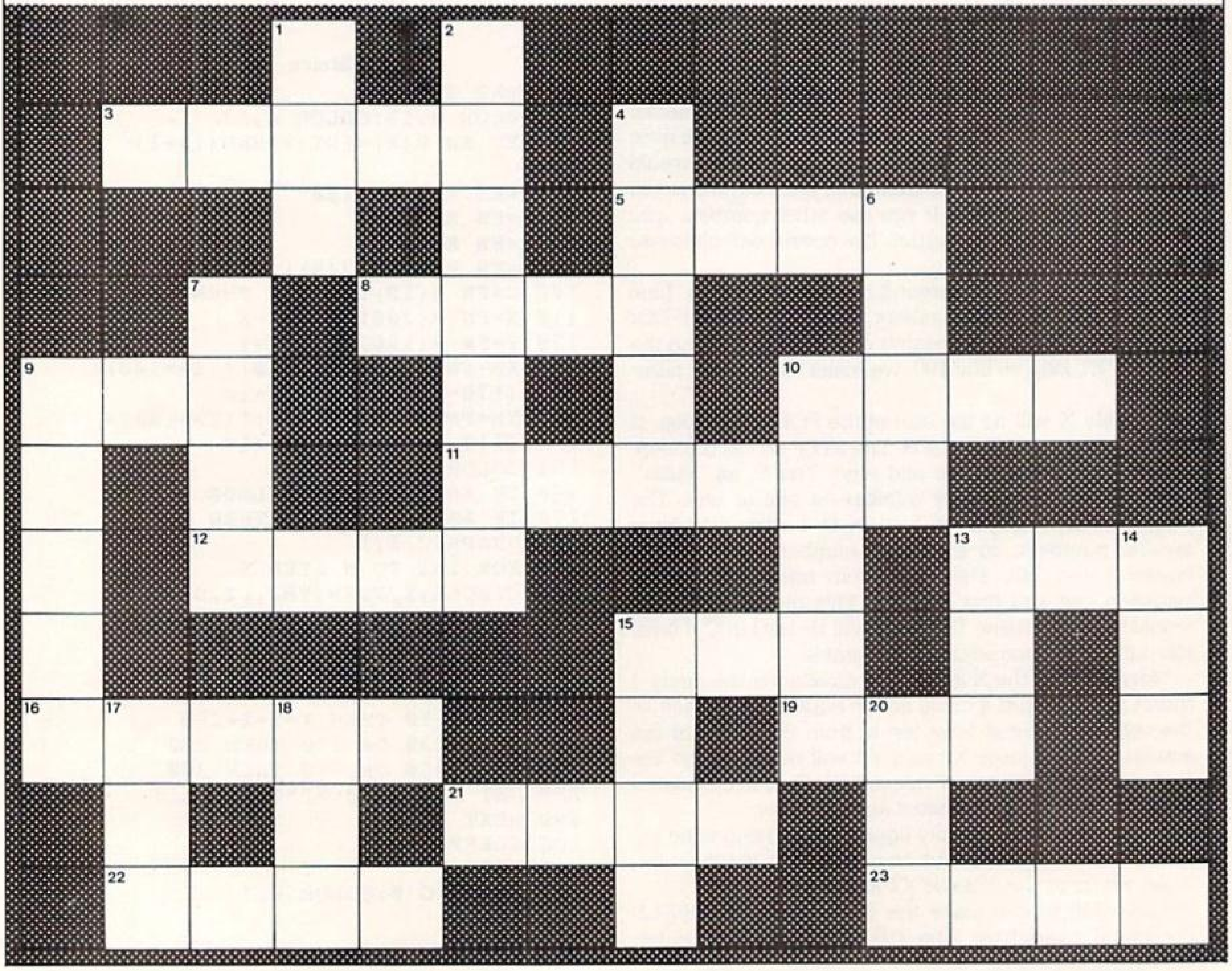
The answers for this crossword puzzle are the familiar Commodore BASIC commands, keywords and functions. The questions, however, aren't! Answers on page 128.

Clues Across:

3. Stuffy
5. Upcoming
8. Tread
9. Receive
10. Furtive glance
11. "I shall ------."
12. Often experienced in the nose
13. 3/7ths of a major salad ingredient
15. What politicians do
16. What these answers have a tenuous relationship with
19. Result of ultraviolet radiation
21. Encumber
22. Facts
23. Do this, and you'll almost always draw some interest

Clues Down

1. Almost half of forever
2. Establishment that sells re's
4. Enter
6. Tea with a chicken
7. Cease and desist
9. "Finchmeyer!" yelled the coach. "Get off the bench and ----- for Kowalski!"
10. Impress
13. Diminutive of Leonardo
14. Famous hunter's first name
15. Done to books
17. Plus
18. Last half of a sprint
20. BASIC function that looks like a brand of plastic



BY LOUIS R. WALLACE

How Your Printer Works

Have you ever wondered how your dot matrix printer works? How does it know to print an I instead of an E? In fact, how does it print anything?

Basically, the printer is another output device like a modem or disk drive. It has enough intelligence to translate codes sent to it from the computer into character patterns that are stored in its ROM memory. These patterns are then translated into electrical signals that in turn tell a specially designed device called a print head to create a line of vertical dots. After several columns of dots have been made, you will have (hopefully) a character you can recognize.

Like other output devices, printers must be instructed to listen to your information if they are to process it. On Commodore computers, you do this by opening a channel to the device. Commodore printers are accessed as device four. Once you have a channel opened, you must give the printer instructions on what to do with the data sent to it. For example:

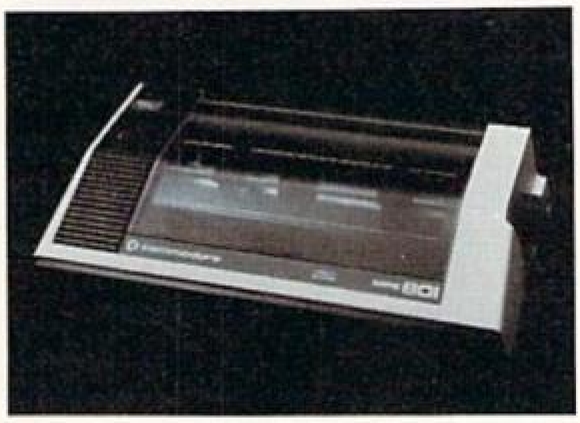
```
10 OPEN 4,4
20 PRINT#4,"This is a test of printing text."
30 PRINT#4
40 CLOSE4
50 END
```

The command OPEN 4,4 sends anything directed to channel four on to device four (printer). The command PRINT#4 indicates that what is to follow is for channel four. Line 30 empties the buffer and line 40 closes the channel.

When you ask a program like a word processor to print out a document for you, the computer must first translate your text into ASCII (American Standard Code for Information Interchange), which is understood by all printers. Each letter, number and symbol has its own specific codes, as do numbers and punctuation marks.

There are also many special non-printable control codes that have a standard ASCII value. For example, the ASCII value 13 always means carriage return, and it will send the printer to a new line to begin printing what follows. The code CHR$(27) sends an ASCII 27, which means ESCAPE. This must be sent prior to certain other codes in order to enable special printer modes.

The print head on the MPS 801 is a vertical column of tiny pins that strike the ribbon hard enough to leave small dots on the paper.



These special control codes are used to signal the printer that you want it to do something besides print ordinary characters. Another good example is ASCII 18 or CHR$(18), which will cause your Commodore MPS-801 to begin printing reverse characters. It will continue printing in reverse until it receives a CHR$(146).

Table 1.
Control Codes for the MPS 801

DESCRIPTION	INPUT CODE
Enter Graphic Mode	CHR$(8)
Line Feed after Printing	CHR$(10)
Carriage Return	CHR$(13)
Enter Double Width Character Mode	CHR$(14)
Enter Standard Character Mode	CHR$(15)
Tab Setting the Print Head	CHR$(16)
Enter Cursor Down Mode	CHR$(17)
Start Reverse Field	CHR$(18)
Repeat Graphics Selected	CHR$(26)
Specify Dot Address (must follow Print Head Tab Code)	CHR$(27)
Enter Cursor Up Mode	CHR$(145)
Turn Off Reverse Field	CHR$(146)

Here are some additional examples of special codes on the MPS 801:

```
10 OPEN 5,4,7
20 PRINT#5,CHR$(18)"This  puts me in REVERSED MODE!"
30 PRINT#5,CHR$(146)"Now  I am in standard mode."
40 PRINT#5,CHR$(14)"I am  now in DOUBLE WIDTH mode!"
50 PRINT#5,CHR$(15)" Again in standard mode."
60 PRINT#5
70 CLOSE5
80 END
```

Commodore uses a slightly modified form of ASCII, called PET ASCII which differs from standard ASCII in that the standard allows for only 128 characters or codes—CHR$(0) through CHR$(127), while PET ASCII will accept CHR$ values up to 255. This allows the computer to use and print those extra graphic symbols that all CBM computers have.

Using a modified ASCII presents no problems if you are using a Commodore printer (like the MPS-801), which is designed to handle the extra codes, but it can be a problem if you are using one of the many different brands available to the consumer today. That is why there are a large number of adapters, called Interfaces, that translate PET ASCII into standard ASCII. Some of these interfaces will allow you to print all the special characters in the CBM character set, while others simply filter them out.

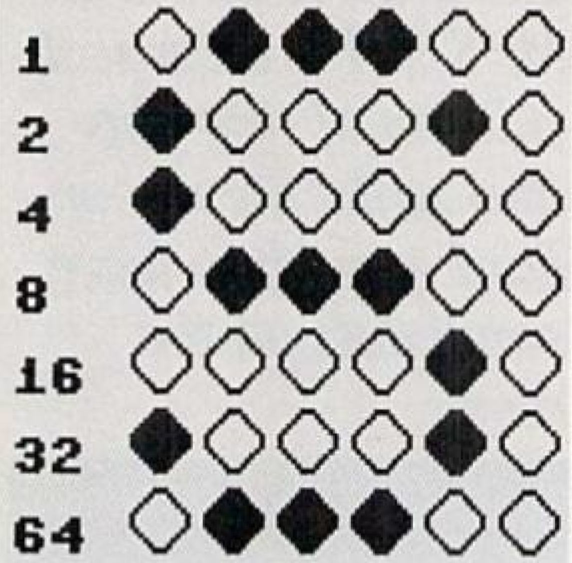
Each printer has special capabilities that can enhance the appearance of your printed output. Some of these are reversed characters, double width, compressed, bold, italic and underlining. Many word processors have pre-defined keys that can signal the printer to begin using a different mode, such as double width characters or bold characters. However, when you are writing your own programs that use the printer, you will find it necessary to instruct the printer with the correct ASCII codes. These control codes, listed here in Table 1, are found in the manual that comes with the MPS-801.

Once the printer has received the code for your character, it looks up the bit-mapped picture that describes the character's appearance. The character is defined as a series of dots in a matrix. In the case of the MPS 801, this is a six-by-seven dot matrix. An example of this character matrix is found in Figure 1.

The MPS-801 is an *impact* dot matrix printer. Its print head is a vertical column of tiny pins that strike the ribbon hard enough to leave small dots on the paper. Each pin corresponds to a dot position in a column of the character matrix. If the character dot is on, the pin at that position is fired, hitting the ribbon and making a dot. If the dot is off, the pin at that position is not activated. As the print head is moved, successive columns of dots are printed, creating the desired character pattern.

After printing a character, the printer looks into its input buffer to see if any more ASCII codes remain. If any remain, they are compared to the printer's stored codes, printed if they are alphanumeric characters, or executed if they are control codes.

Figure 1



It is also possible to custom design characters and have your printer print them. To do this, you must design the character you wish to use, and calculate the binary code it represents. On the MPS-801, the seven dots in each column are equivalent to a seven-bit binary code, where bit zero is at the top and bit six is at the bottom. If a bit is on, its value is two raised to the power of the bit number (2↑0=1, 2↑1=2, 2↑2=4, etc.). If you add the values of all the "on" bits in each column, you will get a number from 0 to 127. By sending these numbers to the printer, preceded by the proper escape and/or control codes, you can custom print any character you wish.

This is the basis of the screen dumps for high-resolution graphics. An area on the bit-mapped screen the size of a character cell is calculated into binary codes. This data is sent to the printer, and the next character cell is calculated and transmitted. This continues until the entire screen has been printed. So every time you print out one of your high-resolution pictures, you are really turning it into many custom characters.

You can see that quite a few things go on every time you use your printer. Most of them occur very quickly and automatically and do not require your attention. But with a little effort, you can use the knowledge of what is happening to get more work and better results from your dot matrix printer. **C**

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BY BRUCE JAEGER

Programmable Pumpkin: A Scary Jack-O-Lantern for the Commodore 128

On Halloween night, set up your TV or monitor in a window and confront your neighborhood goblins with a "live" Jack-O-Lantern.

Like its VIC 20 predecessor "VIC-O-Lantern" (October 1984 *Power/Play*), this Jack-O-Lantern simulator for the Commodore 128 has shifty eyes, lightning, spooky music and weird sounds. But because of the extra power of the 128's BASIC graphics commands, *this* programmable pumpkin adds flying witches, climbing spiders, and ghosts! And all of the "special effects" are contained in independent subroutines. This makes it easy for you programmers to add your own special effects—there's certainly plenty of memory left over with 128K available!

On Halloween night, set up your TV or monitor in a window or on a porch where the neighborhood goblins can see it, and watch as they're confronted with a Jack-O-Lantern that's "alive!" Make sure to adjust the color on your monitor or television set to get the pumpkin a nice orange against a deep black background.

Programmable Pumpkin

```
10 REM **************************
20 REM *                        *
30 REM *     JACK-O-LANTERN     *
40 REM * FOR THE COMMODORE 128  *
50 REM *                        *
90 REM **************************
100 GRAPHIC 1,1:GRAPHIC 0
110 COLOR 0,1 : REM BLACK BACKGROUND
120 COLOR 1,8 : REM YELLOW
130 COLOR 2,6 : REM GREEN
140 COLOR 3,9 : REM ORANGE
150 COLOR 4,1 : REM BLACK BORDER
160 GRAPHIC 3,1 : REM MULTI-COLOR
    GRAPHIC MODE
170 REM DRAW PUMPKIN
180 CIRCLE 3,80,115,75,80
190 REM EYES
200 DRAW 3,55,90 TO 45,105
210 DRAW 3,45,105 TO 70,115
220 DRAW 3,70,115 TO 55,90
230 :
240 DRAW 3,105,90 TO 115,105
250 DRAW 3,115,105 TO 90,115
260 DRAW 3,90,115 TO 105,90
270 :
280 REM DRAW NOSE
290 DRAW 3,80,110 TO 73,130
300 DRAW 3,73,130 TO 87,130
310 DRAW 3,87,130 TO 80,110
320 :
330 REM DRAW MOUTH
340 CIRCLE 3,80,150,40,10
350 :
360 PAINT 3,80,50
370 :
380 REM "BUMPS"
390 FOR X=8 TO 65 STEP 13
400 CIRCLE 0,80,115,X,80
410 NEXT
420 :
430 REM TOP CUTOUT
440 CIRCLE 0,80,30,60,30
450 :
460 REM STEM
470 CIRCLE 2,105,40,30,30,270,320
480 CIRCLE 2,100,35,18,18,250,330
490 CIRCLE 2,80,25,15,17,170,195
500 CIRCLE 2,83,35,15,18,15,30
510 PAINT 2,80,35
520 :
530 GOSUB 2550  : REM READ SPRITE DATA
540 :
```

```
550 DEF FN R(X)=INT(RND(1)*X)+1
560 COLOR 0,1 : COLOR 4,1
570 SCNCLR 0 : GRAPHIC 3,0
580 SPRITE 1,1,8,1,0,0,0
    :SPRITE 2,1,8,1,0,0,0
590 SPRITE 3,0,11,0,0,0,0
    :SPRITE 4,0,11,0,0,0,0
600 MOVSPR 1,125,145 : MOVSPR 3,125,
    145
610 MOVSPR 2,222,145 : MOVSPR 4,222,
    145
620 SPRITE 5,1,5,1,0,0
630 MOVSPR 5,0,70
640 MOVSPR 5,90#1
650 :
660 REM CALL SUBROUTINES IN ORDER
670 GOSUB 2380  : REM SHIFTY EYES
680 GOSUB 1290  : REM MOUNTAIN KING
690 GOSUB 1410  : REM SPIDER
700 GOSUB 1630  : REM FLASH EYES
710 GOSUB 1720  : REM RANDOM
720 GOSUB 1820  : REM CHESHIRE
730 GOSUB 2010  : REM THUNDER &
    LIGHTNING
740 GOSUB 2210  : REM ALARM!
750 GOSUB 1150  : REM EYES UP
760 GOSUB 1170  : REM EYES DOWN
770 GOSUB 1160  : REM EYES NORM
780 GOSUB 2280  : REM GHOST!
790 GOSUB 2500  : REM BLINK
800 :
810 REM CALL SUBROUTINES AT RANDOM
820 C=FN R(17)
830 IF C=1 THEN GOSUB 1030
    : GOTO 820
840 IF C=2 THEN GOSUB 1040
    : GOTO 820
850 IF C=3 THEN GOSUB 1050
    : GOTO 820
860 IF C=4 THEN GOSUB 1270
    : GOTO 820
870 IF C=5 THEN GOSUB 1290
    : GOTO 820
880 IF C=6 THEN GOSUB 1410
    : GOTO 820
890 IF C=7 THEN GOSUB 1630
    : GOTO 820
900 IF C=8 THEN GOSUB 1720
    : GOTO 820
910 IF C=9 THEN GOSUB 1820
    : GOTO 820
920 IF C=10 THEN GOSUB 2010
    : GOTO 820
930 IF C=11 THEN GOSUB 2210
    : GOTO 820
940 IF C=12 THEN GOSUB 2280
    : GOTO 820
950 IF C=13 THEN GOSUB 2380
    : GOTO 820
960 IF C=14 THEN GOSUB 2500
    : GOTO 820
970 IF C=15 THEN GOSUB 1150
    : GOTO 820
980 IF C=16 THEN GOSUB 1160
    : GOTO 820
990 IF C=17 THEN GOSUB 1170
    : GOTO 820
1000 GRAPHIC 0:   STOP
1010 :
1020 REM MOVE EYES LEFT,RIGHT
1030 X2=115:GOTO 1060:REM MOVE LEFT
1040 X2=125:GOTO 1060:REM CENTER
1050 X2=135:GOTO 1060:REM RIGHT
1060 X1=RSPPOS(1,0):REM GET CURRENT X
     POSITION
1070 IF FN R(3)=1 THEN GOSUB 1630
1080 S=1 : IF X1>X2 THEN S=-1
1090 FOR X3=X1 TO X2 STEP S
1100 MOVSPR 1,X3,145 : MOVSPR 3,X3,145
1110 MOVSPR 2,X3+97,145
     : MOVSPR 4,X3+97,145
1120 NEXT : RETURN
1130 :
1140 REM MOVE EYES UP, DOWN
1150 X2=135:GOTO 1180:REM MOVE UP
1160 X2=145:GOTO 1180:REM CENTER
1170 X2=148:GOTO 1180:REM DOWN
1180 X1=RSPPOS(1,1):REM GET CURRENT Y
     POSITION
1190 IF FN R(3)=1 THEN GOSUB 1630
1200 S=1 : IF X1>X2 THEN S=-1
1210 FOR X3=X1 TO X2 STEP S
1220 MOVSPR 1,125,X3 : MOVSPR 3,125,X3
1230 MOVSPR 2,125+97,X3
     : MOVSPR 4,125+97,X3
1240 NEXT : RETURN
1250 :
1260 REM HALL OF THE MOUNTAIN KING
1270 REM SLOW
1280 TEMPO 10 : PLAY "V1T1U5X0"
     : GOTO 1310
1290 REM FASTER
1300 TEMPO 20 : PLAY "V1T0U5X0"
     : GOTO 1310
1310 GOSUB 1030  : GOSUB 2460
1320 P$="Q O1 G A $B O2 C D O1 $B"
1330 P1$="O2 H D Q $D O1 A O2 H $D Q
     C O1 $A O2 H C"
1340 PLAY P$:PLAY P1$:NF=1:GOSUB 1040
     :PLAY P$
1350 PLAY "O2 Q D G F D O1 $B O2 D W
     F"
1360 NF=0 : GOSUB 1630
1370 PLAY P$ : PLAY P1$:NF=1
     :GOSUB 1050:PLAY P$
1380 PLAY "O2 Q D $E D C O1 $B A WG"
1390 GOSUB 1040:RETURN
1400 :
1410 REM SPIDER
1420 VOL 3 : H=FN R(250)+60
1430 MOVSPR 6,H,0
1440 MOVSPR 7,H,0
1450 SPRITE 6,1,13,0
1460 SPRITE 7,0,13,0
1470 FOR X=0 TO 190 STEP 5
1480 MOVSPR 6,H,X
```

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JIFFIES Programmable Pumpkin

```
1490 MOVSPR 7,H,X
1500 FOR D=1 TO 25 : NEXT D,X
1510 IF H<190 THEN GOSUB 1030
     : GOTO 1540
1520 IF H>225 THEN GOSUB 1050
     : GOTO 1540
1530 GOSUB 1040
1540 SLEEP 1
1550 FOR X=190 TO 30 STEP -5
1560 MOVSPR 6,H,X
1570 MOVSPR 7,H,X
1580 SOUND 1,56000-(X*100),1
1590 IF X AND 1 THEN : SPRITE 6,1
     : SPRITE 7,0 : ELSE : SPRITE 7,1
     : SPRITE 6,0
1600 FOR D=1 TO 155 : NEXT D,X
1610 GOSUB 1040  : RETURN
1620 :
1630 REM FLASH EYES
1640 IF NF THEN RETURN
1650 FOR X=1 TO 10
1660 SPRITE 3,1,11,0,0,0,1
1670 SPRITE 4,1,11,0,0,0,1
1680 FOR D=1 TO 10 : NEXT D
1690 SPRITE 3,0 : SPRITE 4,0
1700 NEXT X : NF=0 : RETURN
1710 :
1720 REM RANDOM SPOOKY MUSIC
1730 TI$="000000" : VOL 3
     : N=FN R(60000)+1000 : GOSUB 2460
1740 DO WHILE VAL(TI$)<13
1750 FOR X=1 TO 3
1760 SOUND X,FN R(N)+600,100,0,0,0
1770 NEXT X
1780 ON FN R(7) GOSUB 1030,1040,1050,
     2500,1150,1160,1170
1790 FOR D=1 TO 200 : NEXT D : LOOP
1800 GOSUB 1040 :RETURN
1810 :
1820 REM CHESHIRE PUMPKIN
1830 SPRITE 5,0
1840 GRAPHIC 0
1850 IF FN R(3)=1 THEN 1880
1860 GOSUB 2380:ON FN R(3)GOSUB 1150,
     1160,1170
1870 SPRITE 5,1 : GOTO 1990
1880 REM ROAMING EYES
1890 D=FN R(360) : TI$="000000"
1900 DO WHILE VAL(TI$)<6
1910 MOVSPR 1,D#3 : MOVSPR 2,D#3
1920 SOUND 1,FN R(5000)+1000,100
1930 SOUND 2,FN R(5000)+1000,100
1940 SOUND 3,FN R(5000)+1000,100
1950 LOOP
1960 MOVSPR 1,0#0 : MOVSPR 2,0#0
1970 MOVSPR 1,125,145 : MOVSPR 3,125,
     145
1980 MOVSPR 2,125+97,145
     : MOVSPR 4,125+97,145
1990 GOSUB 1160:GRAPHIC 3 : RETURN
2000 :
2010 REM THUNDER & LIGHTNING
2020 GOSUB 2460 : FOR X=1 TO 3
2030 COLOR 0,2 : COLOR 4,2 : GRAPHIC 0
2040 FOR D=1 TO 1:NEXT D
2050 COLOR 0,1 : COLOR 4,1 : GRAPHIC 3
2060 NEXT X
2070 VOL 15
2080 SOUND 1,25000,5,0,0,0,3
2090 SOUND 2,10000,5,0,0,0,3
2100 SOUND 3,60000,5,0,0,0,3
2110 VOL 5
2120 SOUND 1,100,100,1,20,10,3,4000
2130 SOUND 2,110,100,2,20,90,3,4000
2140 SOUND 3,50,100,0,0,0,3,4000
2150 SOUND 1,100,100,0,0,0,3
2160 FOR X=5 TO 0 STEP-1
2170 FOR D= 1 TO 60 : NEXT D
2180 VOL X : NEXT X
2190 RETURN
2200 :
2210 REM ALARM!
2220 GOSUB 2460 : VOL 10
2230 FOR X=1 TO 5
2240 SOUND 1,30000,50,0,10000,400,0
2250 SOUND 2,26400,50,0,10000,0,0
2260 NEXT : RETURN
2270 :
2280 REM GHOST
2290 GOSUB 2460 : VOL 5
     : V=FN R(100)+80 : MOVSPR 8,350,V
2300 SPRITE 8,1,FN R(16)
2310 SOUND 1,5000,270,2,1000,240,3,100
2320 SOUND 2,1000,270,2,900,100,2,2600
2330 SOUND 3,10000,270,2,9000,240,1,
     100
2340 FOR X=340 TO 0 STEP-1
2350 MOVSPR 8,X,V
2360 NEXT X : RETURN
2370 :
2380 REM SHIFTY-EYES
2390 FOR Z=1 TO FN R(3)+1
2400 GOSUB 1030  : REM MOVE EYES LEFT
2410 GOSUB 1040  : REM MOVE EYES
     CENTER
2420 GOSUB 1050  : REM MOVE EYES RIGHT
2430 GOSUB 1040  : REM MOVE EYES
     CENTER
2440 NEXT Z : RETURN
2450 :
2460 REM RESET SOUNDS
2470 FOR X=1 TO 3 : SOUND X,0,0 : NEXT
2480 RETURN
2490 :
2500 REM RED BLINK
2510 SPRITE 1,1,3 : SPRITE 2,1,3
2520 FOR D=1 TO 500 :NEXT D
2530 SPRITE 1,1,8 : SPRITE 2,1,8
     : RETURN
2540 :
2550 REM READ SPRITE DATA
2560 FOR J=3584 TO 4095 :READ A
     :POKE J,A:NEXT : RETURN
2570 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2580 DATA 0,1,254,0,7,255,128,15,135,
```

JIFFIES *Programmable Pumpkin*

```
     192,31,3,224,31,3,224,31
2590 DATA 3,224,31,3,224,15,135,192,7,
     255,128,1,254,0,0,0,0
2600 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2610 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     1,254,0
2620 DATA 7,255,128,15,135,192,31,3,
     224,31,3,224,31,3,224,31,3
2630 DATA 224,15,135,192,7,255,128,1,
     254,0,0,0,0,0,0,0
2640 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2650 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2660 DATA 120,0,0,252,0,0,252,0,0,252,
     0,0,252,0,0,120,0
2670 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2680 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2690 DATA 0,0,0,0,0,0,0,0,0,0,0,0,
     120,0,0,252
2700 DATA 0,0,252,0,0,252,0,0,252,0,0,
     120,0,0,0,0,0
2710 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2720 DATA 0,0,0,0,0,0,0,0,0,0,1,0,0,
     3,128,0
2730 DATA 15,224,0,3,64,15,255,128,0,
     127,128,0,29,128,240,62,96
2740 DATA 255,255,254,240,58,0,0,58,0,
     0,116,0,0,232,0,0,0
2750 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
     0,0,0
2760 DATA 0,0,0,8,0,32,9,1,32,9,1,32,
     9,41,32,9,41
2770 DATA 32,4,186,64,2,124,128,1,255,
     0,0,254,0,1,255,0,2
2780 DATA 124,128,4,186,64,9,1,32,9,1,
     32,9,1,32,9,1,32
2790 DATA 8,0,32,0,0,0,0,0,0,0,0,0,
     0,0,0,16
2800 DATA 0,16,18,0,144,18,0,144,18,
     40,144,18,40,144,9,57,32
2810 DATA 4,186,64,3,255,128,0,254,0,
     3,255,128,4,186,64,9,57
2820 DATA 32,18,0,144,18,0,144,18,0,
     144,18,0,144,16,0,16,0
2830 DATA 0,0,0,0,0,0,0,0,0,0,0,31,
     0,0,63,224
2840 DATA 0,127,240,0,125,248,0,108,
     252,0,111,252,0,63,254,0,28
2850 DATA 126,0,15,255,0,15,255,128,7,
     255,128,7,255,192,3,255,240
2860 DATA 3,255,254,1,255,252,0,239,
     30,0,119,128,0,48,192,0,8
2870 DATA 32,0
```

END

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Circle Reader Service No. 26

BY ROGER S. MACOMBER

Dogfight!

for the Commodore 64

> *Your right hand grips the stick, your thumb gets poised to fire. You carefully maneuver your craft up behind the enemy plane.*

Imagine that you're returning from a high altitude reconnaissance mission in a plane equipped with only one small machine gun. The sky is blue and cloudless. All you can hear is the muffled roar of your turbine engine. Suddenly, you catch a glimpse of a stray enemy plane. You try to decide whether or not to go after it. Unfortunately, you have only 255 rounds of ammunition and two minutes of extra fuel to ensure your safe return. But it's apparent that he is unaware of your presence, so you decide to go for the kill.

Your right hand grips the stick, your thumb gets poised to fire. You carefully maneuver your craft up behind the enemy plane, waiting to fire until he is directly in front. Your small cannon comes to life with a few carefully selected shots which find their mark. The bandit is trailing smoke and decelerating.

As you close the gap, his plane appears larger in your windshield. Once again, with the plane centered in your gunsight, you fire. A direct hit in his ammunition bay! His plane explodes in a brilliant flash. As you pass through the debris, you feel just a slight bump. But before you can savor the kill, another bogie appears. You're already committed so you go from him, too. And so it goes. How many enemies can you down in two minutes with only 255 rounds of ammo?

Getting Going

To begin, type in the program, lines 5-1040,(don't forget that you'll be using it with the Magazine Entry Program, so have that on standby.) Save this version of the program. For speed and realism, a subroutine written in machine language must be appended using this technique:

1. In direct mode, type the following instruction:

```
PRINT PEEK(45) + 256*PEEK(46) + 319 [RETURN]
```

A number (approximately 5308) will appear.

2. Next, still in direct mode, type in the instruction below, substituting the number on the screen for N.

```
POKE 46,INT(N/256):POKE 45,N-256*INT(N/256)
[RETURN]
```

This instruction pushes back the "end" of your BASIC program to accommodate the machine code.

3. Add the following instruction to the program:

```
15 FOR I=0 TO 318 : INPUT B% : POKE S1+I,B% :
NEXT : STOP' IROK
```

4. Run the program and enter the 319 bytes of machine code as prompted, hitting [RETURN] after each byte. If you make an error during this sequence, hit the RUN-/STOP and RESTORE keys, and restart step 4.

5. Delete line 15 and save the new version of the program. You're all set.

Bandit at Twelve O'Clock High

Now, run the program. There's a brief description of the game and a sample of an enemy plane. When you're ready, hit "R," then enter a skill level (make it easy on yourself, start with one or two). The sky will appear, along with your gunsight and a data panel showing clock time (000200 = two minutes and zero seconds, which ends the game), shots fired (remember, you start

only with 255 rounds), and kills. The enemy plane will appear in a random position.

Now remember: the joystick controls *your* airplane, not the enemy plane. But, if you roll your plane to the left, the bandit will appear to roll to the right. As you move to the left, he appears to move to the right. As you pull back on the stick to climb, he appears to descend. This is because you have no horizon to guide you, so all motion is relative. You must maneuver your plane to bring him into your sight, then fire. If he is indeed within a certain distance from the center of the gunsight, his plane will suffer a bit and appear larger in your windshield. If he has been hit once and is within half that distance when you fire that next time, he will explode and you will get credit for a kill. If, at any time during the chase, you allow him to get outside your view (i.e., too near the edge of the screen), he will disappear only to be replaced by another bandit. When you run out of ammunition or time, the game is over.

How the Program Works

Instructions 80-90 read in the data (lines 1000-1040) which describe the five sprites that are used to create the enemy plane. Instructions 95-115 give screen coordinates (X = 160, Y = 185) to the sprites. Notice that all five sprites are co-located. Lines 120-155 provide the sample bandit rolling from left to right below the initial text until "R" is entered (line 160). Instructions 165-210 get the level, draw the data panel (SYS S1), and set up various graphics and data parameters.

The actual game loops come in instructions 215-265. The sprites are zeroed (line 215), initial coordinates are selected (line 220), and the time and ammo are examined (line 225). Line 280 branches to the machine language subroutine which turns on the sprites, reads the joystick, decides how to move the sprites and whether hits or kills have been scored.

If a kill has been made, line 235 will branch to lines 295-310, which give the explosion. Line 240 detects a vertically off-screen sprite and returns to the beginning of the game loop. Lines 245-255 update the horizontal coordinate and test it for being off screen. The data panel is updated (line 260), and control returns to the time/ammo check. Lines 270-290 end the game.

Before typing in this program, read "How to Enter Programs."

Dogfight!

```
5 POKE 53280,6:POKE 53281,14
  :PRINT"[CLEAR,WHITE,SPACE14]
  DOGFIGHT !!":PRINT'ESVO
10 S1=256*PEEK(46)+PEEK(45)-319
   :S2=S1+54'IXNH
20 PRINT"PLUG JOYSTICK IN PORT 2.
   [SPACE2]REMEMBER: THE"'BAFI
25 PRINT"JOYSTICK CONTROLS [YELLOW]
   YOUR [WHITE]PLANE, AS SHOWN"'BAOO
30 PRINT"BY THE MOVEMENT OF THE
   GUNSIGHT.[SPACE2]YOUR"'BASJ
35 PRINT "SCORE IS 50 TIMES THE
   NUMBER OF KILLS,"'BADO
40 PRINT"LESS THE NUMBER OF SHOTS.
   [SPACE2]THE ENEMY"'BAQK
45 PRINT"LOOKS LIKE THE PLANE BELOW.
   TO SCORE A"'BAGP
50 PRINT"KILL YOU MUST BRING THE
   ENEMY PLANE"'BAPL
55 PRINT"INTO YOUR SIGHT AND FIRE.
   [SPACE2]THE FIRST"'BAUQ
60 PRINT"HIT CAUSES THE PLANE TO
   ENLARGE; THE"'BAUM
65 PRINT"SECOND HIT CAUSES IT TO
   EXPLODE."'BAFQ
70 PRINT"YOU START WITH 255 ROUNDS OF
   AMMO."'BAJM
75 PRINT"PRESS 'R' WHEN READY."'BANO
80 FOR I = 16000 TO 16384 : POKE I,0
   : NEXT'FQDK
85 FOR J = 1 TO 5 : READ SP,B,E
   : POKE 2040 + SP, 250 + SP'HXOS
90 FOR I = B TO E : READ N
   : POKE (250+SP)*64+I-1,N : NEXT I
   : NEXT J'LXMR
95 POKE 53248,160 : POKE 53249,185
   : POKE 53287,3'DCIR
100 POKE 53250,160 : POKE 53251,185
    : POKE 53288,3'DCUC
105 POKE 53252,160 : POKE 53253,185
    : POKE 53289,3'DCAH
110 POKE 53254,160 : POKE 53255,185
    : POKE 53290,3'DCVD
115 POKE 53256,160 : POKE 53257,185
    : POKE 53291,3'DCBI
120 POKE 53269,1  : FOR M = 1 TO 125
    : NEXT'FOXC
125 POKE 53269,2  : FOR M = 1 TO 125
    : NEXT'FOYH
130 POKE 53269,4  : FOR M = 1 TO 125
    : NEXT'FOBD
135 POKE 53269,8  : FOR M = 1 TO 125
    : NEXT'FOFI
140 POKE 53269,16 : FOR M = 1 TO 125
    : NEXT'FPWF
145 POKE 53269,8 : FOR M = 1 TO 125
    : NEXT'FOFJ
150 POKE 53269,4  : FOR M = 1 TO 125
    : NEXT'FOBF
155 POKE 53269,2  : FOR M = 1 TO 125
    : NEXT'FOYK
160 GET AN$ : IF AN$ = "" THEN
    120'EKIF
165 S = 54272 : POKE S+12,32
    :POKE S+13,251:POKE S+8,15'HCNQ
170 PRINT"[CLEAR]":INPUT"LEVEL
    (1-10)";L:PRINT"[CLEAR]":PRINT
    :POKE 679,L:POKE 680,L+1'HSRO
175 POKE 681,2*L : SYS S1'DJGK
180 PRINT TAB(35) "TIME" "[LEFT5,
    DOWN5]" "SHOTS" "[LEFT5,DOWN5]
    " "KILLS";'CERQ
185 TI$="000000": POKE 682,0
```

```
    : KL = 0'DNZO
190 POKE S+6,16 : POKE S+1,200
    : POKE S+24,3 : POKE S+4, 129'IASO
195 POKE 1479,112:POKE 1480,114
    :POKE 1481,110:POKE 1519,107
    :POKE 1520,87'FSEU
200 POKE 1521,115 : POKE 1559,109
    : POKE 1560,113 : POKE 1561,
    125'EKCF
205 POKE 55751,1 : POKE 55752,1
    : POKE 55753,1 : POKE 55791,1
    : POKE 55792,1'FOSL
210 POKE 55793,1 : POKE 55831,1
    : POKE 55832,1 : POKE 55833,1'EGJF
215 POKE 53269,0 : POKE 53271,0
    : POKE 53277,0 : POKE 683,0'EEUK
220 POKE 251,INT(250*RND(1))
    :POKE 252,INT(200*RND(1)+40)'JCGJ
222 POKE 253,2:POKE 254,4'CLPD
225 IF(TI$="000200"OR
    PEEK(682)=255)THEN 270'GQDL
230 SYS S2'BCJA
235 IF PEEK(683) = 2 THEN 295'EJFI
240 IF PEEK (683) = 3 THEN 215'EJXE
245 X = PEEK(251)+PEEK(679)*(PEEK(253)
    -2)'HTIN
250 IF ((X<0) OR (X>255)) THEN
    215'FPBH
255 POKE 251,X'BFDH
260 PRINT"[HOME,DOWN4]"TAB(34)TI$
    :PRINT TAB(34)"[DOWN3]"PEEK(682)
    :PRINT TAB(35)"[DOWN4]"KL'HVCL
265 GOTO 225'BDII
270 SC = KL*50 - SH'DIDH
275 PRINT"[CLEAR]""GAME OVER![SPACE2]
    YOUR SCORE IS ";SC'BDYQ
280 INPUT "PLAY AGAIN"; AN$'BEYI
285 IF AN$ = "Y" THEN PRINT"[CLEAR]"
    : GOTO 170'FHUO
290 STOP : END'CBXG
295 POKE 53281,1 : FOR I=1 TO 75
    : NEXT : POKE 53281,2
    : POKE S+24,15'IDLU
300 POKE S+11,129 : FOR I= 1 TO 75
    : NEXT'GNMD
305 POKE 53281,7 : FOR I = 1 TO 75
    : NEXT : POKE S+11,128
    : POKE S+24,3'JCHN
310 POKE 53281,14 : KL = KL + 1
    :GOTO 215'ESWE
1000 DATA 0,12,52,32,0,0,96,0,0,128,1,
     33,0,0,194,0,0,196,0,1,56,0,0,40,
     0'BMHF
1005 DATA 0,56,0,0,64,0,0,128,0,1,0,0,
     2,0,0,4,0,0,12'BRSG
1010 DATA 1,18,46,4,0,160,24,0,64,64,
     0,161,0,0,60,0,0,40,0,0,120,0,1,
     0,0,4'BONG
1015 DATA 0,0,16,0,0,96'BNTB
1020 DATA 2,19,39,0,16,0,0,124,0,0,16,
     0,0,56,0,255,239,254,64,56,4,0,
     16,0'BNPH
1025 DATA 3,16,48,64,0,0,48,10,0,4,4,
     0,1,10,0,0,120,0,0'BUDI
1030 DATA 40,0,0,60,0,0,1,0,0,0,64,0,
     0,16,0,0,12,4,10,54'BVEF
1035 DATA 8,0,0,12,0,0,2,0,0,1,9,0,0,
     134,0,0,70,0,0,57,0,0,40,0,0'BFSL
1040 DATA 56,0,0,4,0,0,2,0,0,1,0,0,0,
     128,0,0,64,0,0,96'BTWF
```

END

Machine Code to be Appended to Main Program (See Text)

```
162  0  134  251  134  253  162  4  134  252  162  216  134  254
162  0  160  33  169  160  145  251  169  0  145  253  200  192  40
208  243  232  224  25  208  1  96  169  40  24  101  251  133  251
133  253  144  224  230  252  230  254  176  218  165  253  10  170  165
251  157  0  208  165  252  157  1  208  165  254  141  21  208  173
0  220  41  31  141  173  2  41  16  208  106  162  15  142  24
212  238  170  2  162  3  142  24  212  173  23  208  240  48  169
133  56  229  251  16  9  141  172  2  169  0  56  237  172  2
205  168  2  16  27  169  129  56  229  252  16  9  141  172  2
169  0  56  237  172  2  205  168  2  16  6  169  2  141  171
2  96  169  143  56  229  251  16  9  141  172  2  169  0  56
237  172  2  205  169  2  16  55  169  139  56  229  252  16  9
141  172  2  169  0  56  237  172  2  205  169  2  16  34  173
23  208  201  31  240  27  169  0  141  21  208  169  31  141  23
208  141  29  208  165  251  56  233  10  133  251  165  252  56  233
10  133  252  173  173  2  41  1  208  18  165  252  56  237  169
2  133  252  41  127  16  6  169  3  141  171  2  96  173  173
2  41  2  208  16  165  252  24  109  169  2  133  252  144  6
169  3  141  171  2  96  173  173  2  41  4  208  15  230  253
165  254  10  201  32  208  4  169  16  198  253  133  254  173  173
2  41  8  208  14  198  253  165  254  24  106  144  4  169  1
230  253  133  254  96
```

BY MARK JORDAN

Jungle Heat for the Commodore 64

A race through the jungle that requires an acutely accurate sense of timing.

The heat is oppressive, the air stifling. All the animals of the jungle are hidden, silently watching. Two figures emerge from the brush, eyes flashing and deadly. A gunshot is heard. The twosome begins a race through the tropics that simply defies description. The name of the game: Jungle Heat.

Actually, Jungle Heat isn't as serious as all that. But it is fun. The goal is simply to beat your opponent in a race through the tropics. This game does not require razor-sharp reflexes. What it does require is an acutely accurate sense of timing.

Here's how you play. One player mans keys Q and W and controls the black safari-runner named Q-Man. The other player keeps his fingers on P and O to move his blue sprite, appropriately named P-Body. The Q and P keys cause their respective sprites to advance. However, both sprites can't advance at the same time. So to get your sprite to advance, you must beat your opponent to the keypress.

But there's a catch. After each sprite advances, a one-second stopclock begins keeping time in sixtieths of a second (called a jiffies) while the computer looks for a keypress. If it detects a keypress before a full second (60 jiffies) has elapsed, then it will penalize the person who pressed it too soon. Thus, if the player controlling Q-Man presses the Q key at, say, 54 jiffies since the timer started, instead of sending Q-Man forward a stride, he will send his opponent, P-Body, forward. Likewise, if P-Body's host presses the P key too quickly, Q-Man gets a free ride.

Each timing cycle begins when the previous keypress is accepted by your 64. To help you know exactly how many jiffies have gone by since the previous keypress, the figure is reported in the upper left corner of the screen. Keep in mind that the numbers you see there are sixtieths of a second. As you can see, the trick is to press your key after 60 jiffies have transpired but before your opponent does.

That's not the only trick. You also must beware of falling coconuts. Getting hit in the head by one of these sends your opponent three bonus strides forward while you are buried in the humus. If you see one falling, you have two options: Either press Q (or P if you're operating P-Body) and Q-Man will slide forward, hopefully avoiding the falling jungle fruit. Or press the W (or O) key and your sprite will slide backwards. Why would you press W and give up some hard-fought yardage? Because it may be the only way you can avoid the coconut. Please note: While coconuts are falling, you must press and *hold down* the O or W key.

The W and O keys have another function—they cause the coconuts to fall. So when you see your opponent is getting too far ahead, instead of pressing the Q or P key, press W or O. The coconut that hangs nearest your opponent will break free and begin its descent. Then your opponent will have to make a decision whether to try to beat it or retreat from it. The advantages to you, the coconut firer, are that you may get a three-step advance (if your opponent gets conked) or your opponent may retreat to avoid getting hit. The risk is that he'll slide gracefully ahead, making quick yardage.

Let's review the key functions. For player Q, key Q will cause his man to advance; key W will drop a coconut toward his opponent. Key W will also cause Q-Man to slide backwards during a coconut drop, while key Q, of course, will send him sliding forward. Player P just needs to remember that P corresponds to Q and O to W.

The first time or two of playing will be a little hectic. You might not know whose keypresses are doing what. For instance, you may not even press a key at all and yet your sprite advances. This is because your opponent pressed his key too soon. Just keep in mind that the timer is reset immediately following each recorded keypress (which is signified by a new jiffy number being printed on the screen). It helps to let each player take a practice solo run once, keeping their eyes alerted to the jiffy count between keypresses. At the end of each game, the total time elapsed is shown. With this feature, Jungle Heat can even be played solitary. Instead of beating an opponent, you strive to beat your best previous total time score. Like golf, the key is to lower your score each time.

You will undoubtedly wonder about a couple peculiarities of Jungle Heat. One is the fact that P-Body is ten pixels higher on the screen (and thus closer to the coconuts) than Q-Man. It would seem he has less time to react to falling coconuts. But fear not, P-people. Your forward and backward slides are a trifle faster than Q-Man's to compensate. Another quirk occurs when you get conked. If you happened to be sliding forward trying to gain ground, you will not only see your opponent advance three steps, you will lose all the ground you gained during the slide. And if you happen to be at the edge of the woods near the finish line, you will slide back into the woods and momentarily disappear. Don't worry though, you will emerge, eventually. ■

Before typing in this program, read "How to Enter Programs."

Jungle Heat

```
10 POKE 53281,7:POKE 53280,9
   :PRINT"[CLEAR,DOWN]","INSTRUCTIONS
   [SPACE3]Y OR N"'DRII
15 GET A$:IF A$="Y"THEN 515'EIAG
20 IF A$<>"N"THEN 15'EEAB
25 SC=1024:C=55296:B=206:E=235
   :SP$="[SPACE6]"'FCBN
27 J$="[HOME,DOWN14]":H$=LEFT$(J$,
   5)'DLVK
30 FOR T=0 TO 119:POKE SC+T,160
   :POKE C+T,14:NEXT'IUYI
35 FOR T=880 TO 1000:POKE SC+T,160
   :POKE C+T,5:NEXT'IWBN
40 FOR T=759 TO 879 STEP 40
   :POKE SC+T,116:POKE C+T,0:NEXT'JXPK
45 FOR V=1 TO 5:FOR T=B TO E
   :POKE SC+T,160:POKE C+T,5:NEXT
   :B=B+40:E=E+40:NEXT'QHWW
50 PRINT LEFT$(J$,10)'CHWD
55 FOR T=1 TO 12:PRINT,"[RVS,BROWN,
   CMDR L,SPACE2,RVOFF] [RVS] [RVOFF,
   SPACE2,RVS,SPACE2,RVOFF,SPACE2,RVS]
    [RVOFF] [RVS] [RVOFF] [CMDR K]
   [RVS] [RVOFF] [RVS,SPACE2,RVOFF,
   CMDR L]":NEXT'FHDU
60 FOR U=1 TO 10:READ X,Y
   :FOR T=X TO X+Y STEP 40
   :POKE SC+T,32:NEXT:NEXT'NYNP
65 DATA 730,120,745,120,751,120,816,
   40,852,0,861,0,863,0'BXRQ
67 DATA 851,0,814,40,827,40'BTAN
70 FOR T=1 TO 35:READ A,B:POKE SC+A,B
   :POKE C+A,5:NEXT'JUQN
75 DATA 206,32,207,32,208,233,214,223,
   215,233,220,223,221,233,366,32,368,
   95'BRAV
80 DATA 224,223,225,233,233,223,234,
   32,235,32,245,233,276,223,285,105,
   316'BPHR
85 DATA 95,286,233,326,105,327,233,
   367,105,315,223,355,95,354,223,
   395'BLCV
90 DATA 32,394,95,393,223,433,95,176,
   233,177,160,178'BTKO
92 DATA 160,179,223,189,233,190,
   223'BCVM
95 PRINT"[HOME,DOWN,RIGHT2,L. BLUE]
   Q-MAN"TAB(32)"[L. BLUE]P-BODY"'CDJQ
100 FOR K=1 TO 6:READ H1(K),L1(K),
    H2(K),L2(K):NEXT'FDGD
105 DATA 25,30,18,209,33,135,25,30,42,
    62,31,165,50,60,37,162'BBXK
110 DATA 42,62,31,165,50,60,37,
    162'BAHB
115 V=53248:POKE V,0:POKE V+2,0
    :POKE V+21,255:POKE V+1,190'IFEM
117 POKE V+3,180:POKE V+27,3'EMOI
120 FOR S1=12288 TO 12542:READ Q1
    :POKE S1,Q1:NEXT'GWUF
125 FOR T=41 TO 46:POKE V+T,2:NEXT
    :POKE V+39,0:POKE V+40,14'KYBN
130 GOSUB 575:POKE S+24,15:POKE S,220
    :POKE S+1,68:POKE S+5,15
    :POKE S+6,215'KKFL
135 POKE S+7,120:POKE S+8,100
    :POKE S+12,15:POKE S+13,215'IDGO
140 X=RND(-TI):R=1:RR=1:P=192:DP=1:X=1
    :Z=1:W=0:POKE V+16,128'MNQQ
145 FOR T=2042 TO 2047:POKE T,195
    :NEXT'FQHK
150 POKE V+5,114:POKE V+7,104
    :POKE V+9,109:POKE V+11,114
    :POKE V+13,104'KLSO
155 POKE V+15,109:POKE V+4,81
    :POKE V+6,125:POKE V+8,166
    :POKE V+10,202'KKKS
160 POKE V+12,237:POKE V+14,15
    :FOR D=1 TO 3:GOSUB 230:GOSUB 260
    :NEXT'KCKM
165 PRINT"[HOME,RIGHT8,BLUE,RVS]
    WATCH OUT FOR COCONUTS!"'BADO
170 PRINT J$"[RVS,PURPLE]READY"
    :FOR T=1 TO 500:NEXT'FJXJ
175 PRINT J$"[RVS,BLACK,SPACE2]GO
    [SPACE2]":POKE S+4,33
    :FOR T=1 TO 500:NEXT'HPKQ
180 POKE S+4,32:PRINT J$SP$
    :TI$="000000":W=TI:POKE 198,0'GABN
185 IF X>315 THEN 420'DHFL
190 IF Z>315 THEN 425'DHMH
195 GET A$'BCGK
197 Q=TI:PRINT H$SP$H$Q-W+5'EORR
198 IF A$=""THEN 195'DFGO
200 IF A$="P"THEN GOSUB 255'EFTY
205 IF A$="Q"THEN GOSUB 225'EFRE
210 IF A$="O"THEN GOSUB 285'EFVA
215 IF A$="W"THEN GOSUB 290'EFAF
220 POKE 198,0:GOTO 185'CJUA
225 Q=TI:PRINT H$SP$H$Q-W+5
    :IF Q-W<55 THEN 260'IWIN
230 W=TI:FOR U=1 TO 4:GOSUB 490'FLME
235 IF P=192 THEN GOSUB 410'EHQH
240 IF P=193 THEN GOSUB 415'EHWD
245 POKE 2040,P:P=P+DP:IF P<>193 THEN
    DP=-DP'JUDP
250 X=X+2:NEXT:RETURN'EFSE
255 Q=TI:PRINT H$SP$H$Q-W+5
    :IF Q-W<55 THEN 230'IWFQ
260 W=TI:FOR U=1 TO 4:GOSUB 505'FLJH
265 IF P=192 THEN GOSUB 410'EHQK
270 IF P=193 THEN GOSUB 415'EHWG
275 POKE 2041,P:P=P+DP:IF P<>193 THEN
    DP=-DP'JUES
280 Z=Z+2:NEXT:RETURN'EFWH
285 X1=V:X2=X1+1:X3=190:X4=311:X5=253
    :X7=X:X8=1:GOTO 295'JOBY
290 X1=V+2:X2=X1+1:X3=180:X4=301
    :X5=254:X7=Z:X8=2'JLYT
295 SX=V+4:SY=V+5:X6=PEEK(X1)
    :IF PEEK(V+16)>128 THEN SY=V+15
    :SX=V+14:GOTO 310'QPNF
300 IF X6=<PEEK(SX)THEN 310'FJSC
305 SX=SX+2:SY=SY+2:GOTO 300'FPOJ
310 FOR T=1 TO 15:POKE V+30,0
    :IF PEEK(SY)=>215 THEN POKE X2,X3
    :GOTO 355'MCAL
315 G=(PEEK(V+30)AND X5):GG=G AND X8
    :IF G>3 AND GG<>0 THEN 360'MACQ
320 POKE SY,PEEK(SY)+4'DIMD
325 IF R>7 OR RR>7 THEN 350'FINJ
330 AA=PEEK(197):IF AA=41 AND X3=180
    THEN Z=Z+5:GOSUB 500:R=R+1
    :NEXT'NEHP
335 IF AA=62 AND X3=190 THEN X=X+5
```

```
    :GOSUB 485:RR=RR+1:NEXT'LXYR
340 IF AA=38 AND X3=180 THEN Z=Z-2
    :GOSUB 500:NEXT:GOTO 355'KVRM
345 IF AA=9 AND X3=190 THEN X=X-2
    :GOSUB 485:NEXT:GOTO 355'KUGQ
350 POKE SY,PEEK(SY)+4:NEXT'EJYG
355 R=1:RR=1:RETURN'DHOK
360 GOSUB 410:FOR T1=1 TO 18
    :POKE SY,PEEK(SY)-1'HSYL
365 POKE X2,PEEK(X2)+2:NEXT'EJEM
370 IF PEEK(X2)>216 THEN POKE X2,
    216'FNEJ
375 FOR T1=1 TO 33:POKE SY,PEEK(SY)+2
    :IF PEEK(SY)>225 THEN POKE SY,
    225'LDEW
380 NEXT'BAEF
385 IF X4=301 THEN FOR T2=1 TO 3
    :GOSUB 230:NEXT'IOUR
390 IF X4=311 THEN FOR T2=1 TO 3
    :GOSUB 260:NEXT'IOYN
395 IF R>1 THEN FOR T5=1 TO R
    :GOSUB 505:Z=Z-6:NEXT'KPFU
400 IF RR>1 THEN FOR T5=1 TO RR
    :GOSUB 490:X=X-5:NEXT'KRLI
405 POKE X2,X3:R=1:RR=1:RETURN'ENHI
410 POKE S+4,129:POKE S+4,128
    :RETURN'FOHF
415 POKE S+11,129:POKE S+11,128
    :RETURN'FQYK
420 TT$=TI$:GOSUB 455:I=I+1
    :PRINT"[HOME,DOWN2,RIGHT4]";I
    :GOTO 430'GVLJ
425 TT$=TI$:GOSUB 455:M=M+1
    :PRINT"[HOME]",,,"[DOWN2,RIGHT5]";
    M'FUTN
430 PRINT"[HOME]"SPC(250),SPC(250),
    SPC(250),SPC(156)"TIME
    : ";RIGHT$(TT$,3)'GCSL
435 PRINT"[HOME]"SPC(132)"PLAY AGAIN?
    Y OR N"'CEMM
440 GET A$:IF A$="Y"THEN PRINT"[HOME]
    "SPC(132)"[SPACE18]":GOTO 130'HNNL
445 IF A$<>"N"THEN 440'EFAK
450 POKE 53281,11:PRINT"[HOME]
    "SPC(250),SPC(236)"[WHITE,RVS]
     QUITTER ":END'FTEM
455 POKE S+5,85:POKE S+6,85
    :POKE S+12,85:POKE S+13,85
    :POKE S+4,33:POKE S+11,17'MNKX
460 FOR K=1 TO 6'DDLG
465 POKE S+1,H1(K):POKE S,L1(K)
    :POKE S+8,H2(K):POKE S+7,
    L2(K)'HJCV
470 IF H1(K)=50 THEN FOR T1=1 TO 200
    :NEXT'HOGM
475 FOR T2=1 TO 100:NEXT'EHSN
480 NEXT:GOSUB 575:RETURN'DFCI
485 POKE SY,PEEK(SY)+4'DIMP
490 RX=INT(X/256):LX=X-RX*256'GRMP
495 POKE V,LX:POKE V+16,
    PEEK(V+16)OR RX:RETURN'HRNU
500 POKE SY,PEEK(SY)+4'DIMD
505 RZ=INT(Z/256):LZ=Z-RZ*256'GRWM
510 POKE V+2,LZ:POKE V+16,
    PEEK(V+16)OR RZ*2:RETURN'JTWK
515 PRINT:PRINT:PRINT:PRINT"'Q' MOVES
    THE BLACK SPRITE FORWARD."'EDFR
520 PRINT"'W' MOVES HIM BACKWARD
    DURING A COCONUT"'BAJL
525 PRINT"[SPACE4]DROP.[SPACE2]
    IT ALSO FIRES COCONUTS."'BAWP
530 PRINT:PRINT"'P' MOVES THE BLUE
    SPRITE FORWARD."'CBPM
535 PRINT"'O' MOVES HIM BACKWARD
    DURING A COCONUT"'BABR
540 PRINT"[SPACE4]DROP.[SPACE2]
    IT ALSO FIRES COCONUTS."'BAWM
545 PRINT:PRINT"THERE IS A ONE-SECOND
    INTERVAL BETWEEN"'CBMT
550 PRINT"SPRITE ADVANCES.[SPACE2]
    DON'T PRESS TOO SOON--"'BAGP
555 PRINT"THE JIFFY TIMER UPPER LEFT
    MUST READ"'BAIT
557 PRINT"60 OR YOUR OPPONENT
    ADVANCES."'BAJT
560 PRINT:PRINT"PRESS ANY KEY TO
    CONTINUE"'CBCN
565 GET A$:IF A$=""THEN 565'EIPO
570 IF A$<>""THEN PRINT"[CLEAR]"
    :GOTO 25'GFGL
575 S=54272:FOR T=S TO S+24:POKE T,0
    :NEXT:RETURN'ISPU
580 DATA 3,254,0,30,31,224,48,255,159,
    99,252,158,103,252,240,111,255,
    192,103,255'BVYV
585 DATA 0,99,252,0,51,240,0,27,88,0,
    28,255,128,48,239,248,33,225'BGLX
587 DATA 255,1,224,15,3,192,30,7,128,
    60,7,128,96,15,0,252,12,1,248'BHNA
590 DATA 31,128,0,31,128,0,0,1,255,0,
    15,207,224,28,255,152,51,249,
    159'BKET
595 DATA 103,249,255,111,255,254,103,
    254,0,39,224,0,54,12,0,112,
    124'BIYY
600 DATA 0,192,126,0,0,126,0,0,94,0,0,
    94,0,0,95,0,0,223,0,0,223,0,0'BITL
605 DATA 223,0,1,220,0,1,223,224,1,
    223,224,0,0,248,0,2,255,0,5,255,
    128'BLHR
610 DATA 9,255,224,19,255,240,27,255,
    240,27,255,254,27,255,255,63,
    254'BKSN
615 DATA 0,252,0,0,0,62,0,0,62,0,0,62,
    0,0,125,0,1,252,128,3,231,192,
    255'BMQS
620 DATA 195,192,255,131,192,224,3,0,
    192,3,240,0,3,240,0,0,0,0,0,0,0,
    0'BNQO
625 DATA 0,0,0,0,0,0,0,0,253,0,3,143,
    192,7,15,240,14,31,248,31,255,
    252'BLDT
630 DATA 111,255,251,56,255,134,15,0,
    120,7,255,240,3,255,224,0,255'BHJO
635 DATA 128,0,0,0,0,0,0,0,0,0,0,0,0,
    0,0,0'BIEO
```

END

BY ROBERT ALONSO

Game Design on the 64

Part 1: Custom Characters

> *In this first of a five-part series, you will learn how to design one-color and multi-color custom characters and use them in your programs.*

Custom characters are perhaps one of the most necessary ingredients for creating arcade-style games on a home computer. It's inconceivable to program a space invader-type game or any other space game using letters as aliens. It wouldn't be very exciting to play or even look at. Custom characters are letters that have been redesigned to look like any type of creature or space vehicle that you can imagine. The Commodore 64 allows you to easily re-define characters for games or for just about any other purpose you may have in mind.

Creating custom characters on the 64 is a matter of knowing where the original character set is located in ROM, where you would like to place it in RAM memory, and where the pointer that enables your new character set is located. You will also have to turn off the interrupts and switch in the ROM character set. Then, after you copy the characters to RAM, you will have to switch the character ROM out and re-enable the interrupts. All this sounds more complicated than it actually is, so don't despair. You'll also need to know a little addition, but this should not be a problem.

Turning Off the Interrupts

The first step is to turn off the keyboard interrupts. This step is easily accomplished by typing in the following line:

```
10 POKE 56334, PEEK(56334)
   AND 254
```

The reason that this is necessary is that you will have to switch in the character ROM in the next step and doing so requires this first step as a safety measure.

The second step is to switch in the character ROM. The following line does it for you:

```
20 POKE 1, PEEK(1) AND 251
```

The ROM character set is now in memory locations 53248 through 57343. This step is important because normally these locations contain the VIC II chip, the SID chip, color RAM, and the two Complex Interface Adapters (CIA's).

If these were left in their place, you wouldn't be able to read the character data. The Commodore 64 is structured with 64K of RAM memory and 20K of ROM memory. The computer's internal brain, or Central Processing Unit (CPU), is a 6510, which can handle only 64K of memory at any one time. The 6510 uses a sophisticated approach to switching ROM and RAM into various sections of high memory. The location which the system looks at to see how the memory is organized is memory location one. This approach at squeezing more memory into a computer is very complicated and isn't really necessary to detail here. All we need to know is that to see the character ROM, the above line must be executed.

ROM to RAM

Now you are ready to switch the ROM image of the character set into a section of RAM. To keep things simple, it is only necessary to copy the first 64 characters. The section of RAM which is often recommended for an alternate character set is the one starting at memory location 12288 and ending at 12799. The program line that will do this for you is:

```
30 FOR X=12288 TO 12799:
   POKE X, PEEK (X+40960):
   NEXT X
```

Now an identical image of the ROM is in RAM ready to be modified, but first two things must be taken care of. The character ROM must be switched out and the keyboard interrupts turned on again. These are the two closing steps:

```
40 POKE 1, PEEK(1) OR 4
50 POKE 56334, PEEK(56334)
   OR 1
```

Everything is now set for the creation of good-looking character forms.

Setting the Pointer

The reason all the previous steps were needed is because it is not possible to write (poke) into ROM memory. You must have the character set in RAM to modify it. Any pokes to memory locations 12288 through 12799 will now affect the appearance of a character.

To see the new character set (it will look identical to the old one), the following line must be typed in:

```
60 POKE 53272, (PEEK(53272)
   AND 240) OR 12
```

This line shifts the character-set pointer from its ROM location to the RAM location starting at 12288. The VIC II chip will now get all of its character data from the RAM area. If you have been typing in the lines as you have been reading and have run the program, you will now be looking at the new character set. To experiment a little, you can type some commercial "at" (@) symbols on the screen. Now if you poke a number between zero and 255 into memory locations 12288 through 12295, you will see the changes that the symbol undergoes. Do this for a while and experiment with the results. You will probably be surprised by the crazy effects that doing so will create. If you want to also fool around with the letter A instead of the @ symbol, you can poke into memory locations 12296 through 12303. Fun, isn't it?

The complete listing that you should have so far is shown in Program 1. Now that the routine part of the process has been finished, you should learn how to design your own characters. Save Program 1, because it is going to be expanded after a brief explanation.

Continued next page

Consecutive Bytes

Each character design is made of eight consecutive memory locations. Each of these locations is called a byte. Each byte has eight bits that can be individually turned on and off by using pokes. You can form a letter or character by turning on some bits and turning some others off to form a pattern. Try to imagine an eight-by-eight set of light bulbs that you can turn on or off at the flick of a switch.

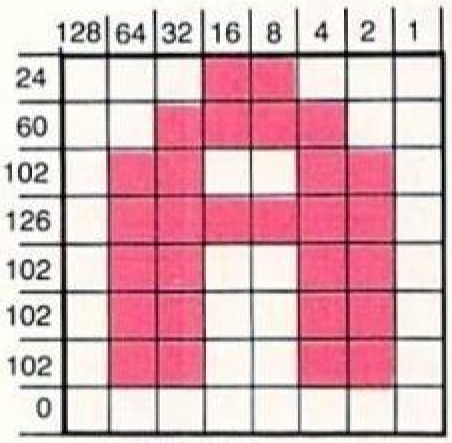


Figure 1.

Let's say that you wanted to make a box out of the eight-by-eight grid. To do this, you would have to turn on the lights around the border of the grid. Using the same technique, you can design just about anything you can imagine.

Figure 1 shows you how the letter A is formed. The numbers that you see to the left of the design are derived from the diagram by adding together the values that the blocks represent. Each block represents a number, as shown, based on the binary number system. Computers use the binary system because internally they can understand only two stages of being—on and off.

> *Custom characters are letters that have been redesigned to look like any type of creature or space vehicle that you can imagine.*

In Figure 1, a filled block represents a binary one and an empty block a binary zero. By adding up the values of each place that is "on" starting from the right and going towards the left, you can derive the number you will need in your program's data statements.

To create any new characters, you will have to design an eight-by-eight grid and fill in the blocks that you want turned on in the screen image of that character. Figure 2 illustrates the way it is done a little more clearly.

For the computer to know what you want it to design on the screen, you will have to put the numbers that correspond to each row of the design in data statements. Let's say that you wanted to do the box character that I mentioned before. The first row would have to have a value of 255 because every bit is lit and the second one would have a value of 129 because the first and last bits are lit. The value is 129 because the right-most bit has a value of one and the left-most bit has a value of 128. All the other rows except the eighth one will also have a value of 129. The eighth row will be 255 because all the bits are on. The box character would thus be represented with the following line:

90 DATA 255, 129, 129, 129,
129, 129, 129, 255

The box character's grid representation would look like Figure 3.

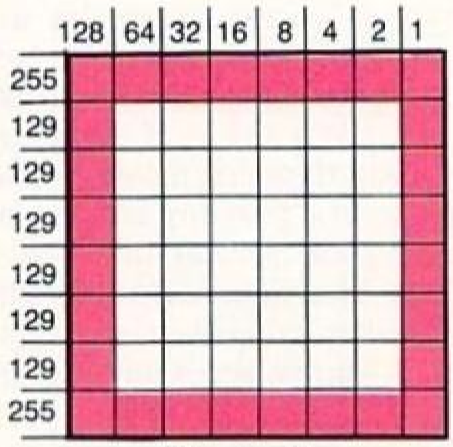
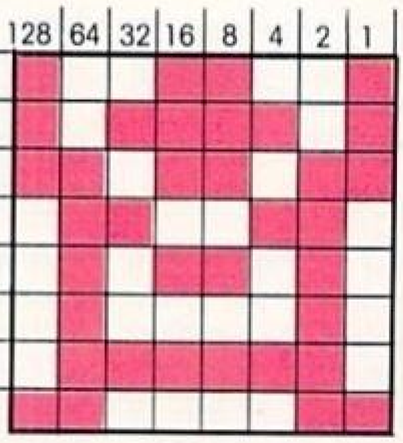


Figure 3.

After you have converted all your characters into data statements, you can then poke them into memory lo-

Figure 2.

128 + 16 + 8 + 1 = 153
128 + 32 + 16 + 8 + 4 + 1 = 189
128 + 64 + 16 + 8 + 2 + 1 = 219
64 + 32 + 4 + 2 = 102
64 + 16 + 8 + 2 = 90
64 + 2 = 66
64 + 32 + 16 + 8 + 4 + 2 = 126
128 + 64 + 2 + 1 = 195



Before typing this program, read "How to Enter Programs."

Program 1. Character Set Exchanger

```
10 POKE 56334, PEEK(56334) AND
   254'DQQC
20 POKE 1, PEEK(1) AND 251'DIBB
30 FOR X=12288 TO 12799
   : POKE X, PEEK(X+40960)
   : NEXT X'HYRI
40 POKE 1, PEEK(1) OR 4'DGCD
50 POKE 56334, PEEK(56334) OR 1'DORF
60 POKE 53272, (PEEK(53272) AND 240)
   OR 12'EUHI
```

END

Before typing this program, read "How to Enter Programs."

Program 2. Advanced Character Exchanger

```
5 A$= "A"'BCNE
10 POKE 56334, PEEK(56334) AND
   254'DQQC
20 POKE 1, PEEK(1) AND 251'DIBB
30 FOR X=12288 TO 12799
   : POKE X, PEEK(X+40960)
   : NEXT X'HYRI
40 POKE 1, PEEK(1) OR 4'DGCD
50 POKE 56334, PEEK(56334) OR 1'DORF
60 POKE 53272, (PEEK(53272) AND 240)
   OR 12'EUHI
65 Y= 12288+(ASC(A$)-64)*8'FPCN
70 FOR X= Y TO Y+7: READ A: POKE X, A
   : NEXT X'HMJK
90 DATA 255, 129, 129, 129, 129, 129,
   129, 255'BGAL
```

END

cations where your new character set is located. You'll recall that the character set we are working on is located between 12288 and 12799. If you write a short FOR/NEXT loop that pokes the data into the proper memory locations, you will get your character as part of the computer's new character set. The FOR/NEXT loop that will poke our block character into the @ symbol's location is:

```
70 FOR X=0 TO 7: READ A:
    POKE 12288+X, A: NEXT X
```

If you saved Program 1, load it into your computer and add lines 70 and 90 now, and the following line as well:

```
80 PRINT "@ @ @ @"
```

If everything has been typed in correctly, when you run the program you will see the screen behave strangely for a while, then return to normal and finally, you should see four block characters on the screen.

Aliens, Airplanes and Symbols

Now that you have a complete custom character program, you can start to design some alien creatures, airplanes, or any other graphic symbol you might like to see in your programs. One very practical application of custom characters is for foreign alphabets like the French alphabet, which uses accent marks.

Program 1 is limited because it isn't general enough. For example, let's suppose that you prefer not to change the commercial "at" symbol, but want to change the F instead. Program 1 would be useless as is. Since you want to be able to change specific characters, to accomplish this you can use Program 2. Program 2 lets you specify which letter you want to change by setting it equal to A$ in line 5 of the program. Line 65 contains the formula that converts A$ to the memory location where that character begins in memory. As it stands, Program 2 will convert the letter A into a box character. Using Program 2, you can design a character and place it anywhere in the Commodore character set without difficulty.

> *The Commodore 64 allows you to easily re-define characters for games or any other purposes you have in mind.*

Custom characters are good to have, but singly they really don't look like much on the screen because Commodore 64 characters are very small. To really have a distinguishable design, you will have to create several characters and place them side by side or one on top of the other. To accomplish this, all that you do is draw two eight-by-eight grids and lay them out side by side on a flat surface.

Now design your characters and place both sets of data statements in Program 2. All you have to do is place the second set of data in a new line following line 90 and change the Y+7 of line 70 to Y+15. The program will now put the first character into the letter that A$ is set equal to and the second character into the letter following that one. For example, if the program is only modified in line 70 and the extra data added into a new line 95, you would end up with the first character design where the letter A used to be and the second character design where the letter B used to be. If you pressed the letters A and B on the keyboard, you would then get the original character that you designed. This technique can be expanded to include numerous characters that you can PRINT side by side and one on top of the other on a screen to create graphic displays.

Multi-Color Characters

Custom characters can also be created in multi-color. This means that you can take a character and instead of just seeing it in two colors—the character's color and the background color—you can see it in four colors. These colors are: character color, background color, background color 1, and background color 2. These colors are controlled by the registers at memory locations 53280, 53281, and 53282. The character color is set individually by poking the correct value into color RAM starting at 55296.

The binary coding necessary for creating multi-color characters generally follows the same theory that creating one-color custom characters does, but there are some differences. In a one-color custom character, every bit which is turned on represents the character's color, but in a multicolor custom character, every two bits represents one of the four possible colors. Because of this, some horizontal resolution is lost. Since each horizontal row has eight bits, that means that there are actually four two-bit pixels (or nybbles, as they are officially called). If both bits of a nybble are turned on, then that nybble becomes the color specified by color RAM. If both are off, then that nybble is colored with the background color

Figure 4.

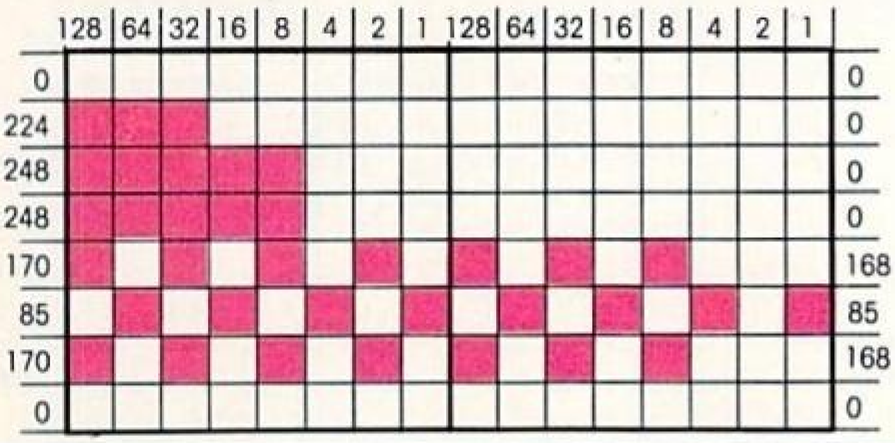


Table 1.

00	Background color	POKE 53281,(color)
01	Background 1	POKE 53282,(color)
10	Background 2	POKE 53283,(color)
11	Color in color RAM	

Table 2.

0	00	00	00	00	Background color
85	01	01	01	01	Color at 53282
170	10	10	10	10	Color at 53283
255	11	11	11	11	Color RAM (55296-56295)
0	00	00	00	00	
85	01	01	01	01	
170	10	10	10	10	
255	11	11	11	11	

specified by memory location 53281. The other two colors are produced by a one-bit-on, one-bit-off combination. The chart in Table 1 may be helpful to you. In addition, a multi-color character can be produced as shown in Table 2.

The numbers in Table 2 will produce a striped custom character if they are poked into memory using Program 2. To see it in multi-color, though, you will have to enable the multi-color code. This is done by using the following command in immediate or program mode:

```
POKE 53270, PEEK(53270) OR 16
```

After you are done with the demonstration, you can disable the multi-color mode by typing in the following command:

```
POKE 53270, PEEK(53270) AND 239
```

If you want a complete program that will demonstrate the effects that are possible with a multi-color custom character, type in Program 3. Once you see the spaceship on the screen, try poking different values into memory locations 53282 and 53283. You will also be able to change the character's color by poking values into memory locations 55296 and 55297. The values poked into memory location 55296 and 55297 must be higher than eight so that the characters remain in the multi-color mode.

Program 3 uses a different technique for loading data into its correct location in RAM. You'll notice that it uses the same formula as Program 2, but the difference is in how it obtains its value for A$. Instead of having A$ assigned a value at the beginning of the program, the value is obtained from the data statements (they are within quotes in lines 75 and 80). If you were to have many characters that you needed customized, you could use this technique easily. Just make the second number of the loop (X1) at line 40 the number of characters you are redefining (currently it is a 2). The first character in each data statement should be the letter that you want redefined.

> *You form a letter or character in an eight-by-eight grid by turning off some bits and turning on others.*

The Letter Spaceship

When you run Program 3, you will get a small spaceship printed in the upper left corner of the screen. The spaceship is composed of what used to be letters A and B side by side, thus illustrating that a custom character can be more than one character wide. The spaceship is in multi-color and so is the rest of the screen. Because the entire screen is in multi-color, you will have a very difficult time reading your attempts at poking values into memory locations 53282 and 53283, but you should try nonetheless. The stripes that compose the spaceship will change colors as you poke the new values into these locations. Figure 4 illustrates the coding necessary to create the spaceship.

After you have played with this character for a while, you may want to experiment with one of your own. To do so, you can just change the numbers in the data statements, but first remember to disable the multi-color mode. If you do not disable the multi-color mode, you may not be able to see what you are trying to type. You can disable the mode by either typing in the following line or hitting the RUN/STOP and RESTORE keys.

```
POKE 53270, PEEK (53270) AND 239
```

In future columns, you will find out what a sprite is and how to create one. You will also find out that there is a register in memory that is peeked to see if a sprite has hit a background location. The background may be created in either keyboard characters, custom characters, or in multi-color custom characters. If you use multi-color custom characters, you have the benefit of being able to code the background with a 01 binary pattern. All locations with this pattern may be touched by a sprite without causing the register to be set.

This means that if you wanted to construct a building out of blocks of solid color, you could make the blocks out of multi-color custom characters that have all the rows of bytes equal to 85. The data line that is necessary for this is:

```
DATA 85, 85, 85, 85, 85, 85, 85, 85
```

If the sprite ever touched a block composed of this bit pattern, nothing would happen as long as it was in multi-color. This is a big advantage to you as a programmer because it can enable you to decide exactly which element of a background will cause a collision to register and which element will not. For example, you may want a mine to register a collision and a smile face not to, or any other similar situation you may think of.

The next installment of this column will be devoted to programming custom characters in machine language.

Before typing this program, read "How to Enter Programs."

Program 3. Multi-Color Spaceship

```
10 POKE 56334, PEEK(56334) AND
   254'DQQC
15 POKE 1, PEEK(1) AND 251'DIBF
20 FOR X=12288 TO 12799
   : POKE X, PEEK(X+40960)
   : NEXT X'HYRH
25 POKE 1, PEEK(1) OR 4'DGCG
30 POKE 56334, PEEK(56334) OR 1'DORD
35 POKE 53272, (PEEK(53272) AND 240)
   OR 12'EUHK
40 FOR X1=1 TO 2:READ A$'EHHD
45 Y= 12288+(ASC(A$)-64)*8'FPCL
50 FOR X=Y TO Y+7: READ A: POKE X,A
   : NEXT X,X1'HPJJ
55 POKE 53270, PEEK(53270) OR 16'DPNK
60 PRINT CHR$(147); "AB"'CGNF
65 POKE 55296,12: POKE 55297,12'CRGL
70 POKE 53282,1:POKE 53283,3'CPTH
75 DATA "A", 0, 224, 248, 248, 170,
    85, 170, 0'BCUN
80 DATA "B", 0, 0, 0, 0, 168, 85, 168,
    0'BVRI
```

END

BY ROGER S. MACOMBER

Multi-Color Bar Graphs for the Commodore 64

Create bar graphs with overlays using your own data.

One of the most important applications of the Commodore 64 is the creation of impressive multi-colored graphics, limited only by the programmer's imagination. An especially useful example is the conversion of numerical distribution data into pie charts and bar graphs. While there are several types of software that can be purchased for such applications, this program allows you to construct scaled bar graphs of any X,Y data, with high (one pixel) resolution in the Y-coordinate. It also permits you to overlay a second set of data (in a different color) on the first set.

How to Use the Program

After you have carefully typed in the program as shown at the end of this article, save it. To get the best looking graphs, it is necessary to make some decisions about how you want the data to appear. First, you will be asked for axis titles (up to five characters each) and plot titles (up to ten characters each).

Next, you will input the number of data sets (one or two) and the boundaries (XHI and XLO) of the X values. There are three factors to consider when selecting XHI and XLO. First, XHI should be *greater* than or equal to the largest X value, and XLO *less* than the smallest X value. Second, because the X coordinate is low resolu-

Table 1. Payback Parameters for a $100,000 Loan at 12% APR for 30 years.

Year	Total Paid, $	Principal Paid, $
1	12343.	362.
2	24686.	771.
3	37029.	1232.
4	49373.	1751.
5	61716.	2336.
6	74059.	2996.
7	86403.	3738.
8	98746.	4575.
9	111089.	5519.
10	123433.	6582.
11	135776.	7779.
12	148119.	9129.
13	160463.	10649.
14	172806.	12363.
15	185149.	14294.
16	197493.	16470.
17	209836.	18921.
18	222179.	21684.
19	234523.	24797.
20	246866.	28305.
21	259209.	32257.
22	271553.	36711.
23	283896.	41730.
24	296239.	47386.
25	308583.	53758.
26	320926.	60939.
27	333269.	69031.
28	345612.	78148.
29	357956.	88422.
30	370299.	100000.

Figure 1. All 30 points plotted

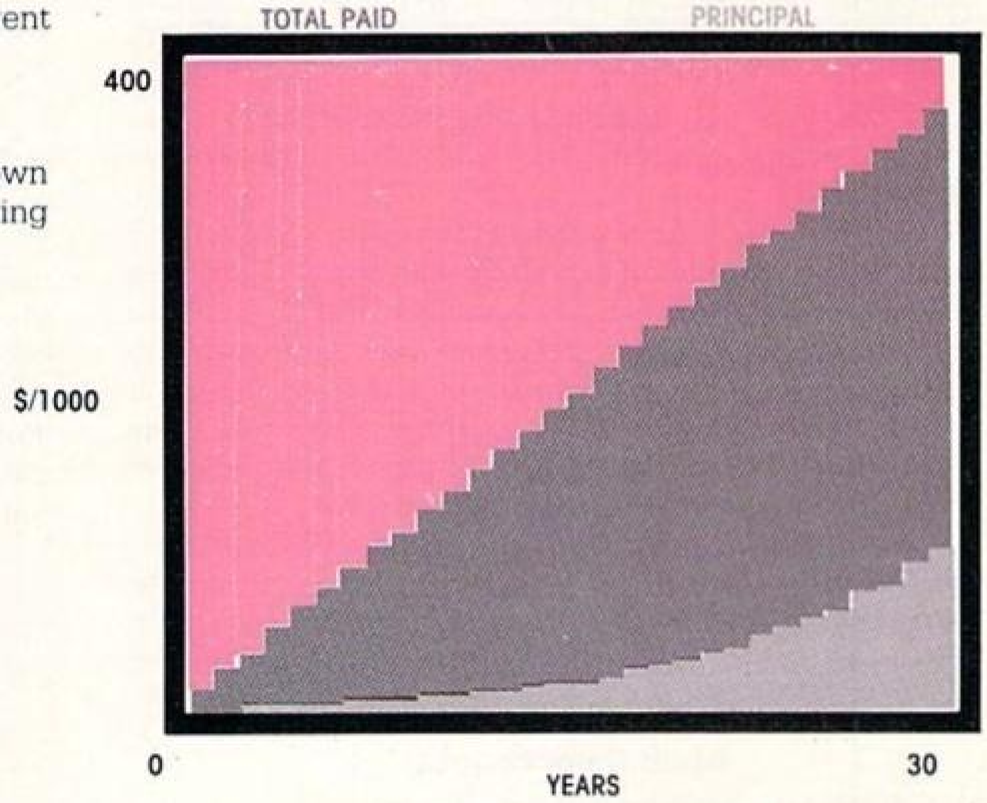
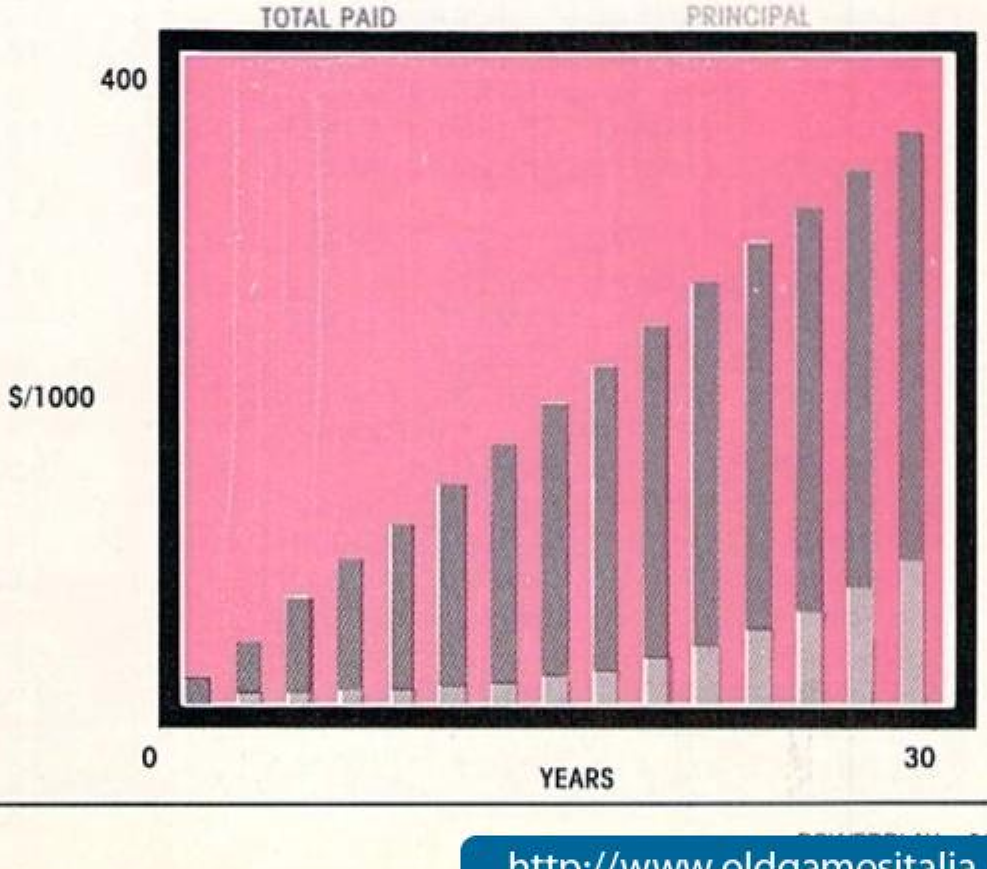


Figure 2. Every other point plotted



You can, for example, plot the data for a 30-year mortgage.

tion (one character), XHI-XLO should be an exact multiple of 30. And finally, when written on the screen, XHI and XLO should be no more than four characters in length (including any decimals). Longer numbers (or decimals) are automatically scaled by the parameter XF, which is the multiple of ten that, when multiplied by XHI and XLO, brings them to a four-character length. (Note: Your axis title should reflect this scaling.)

You will also input YHI, YLO, and YF, which are subject to the same constraints as above except that, because the Y-coordinate is high resolution, there is no constraint on YHI-YLO. Next, you will enter the number of points (up to 300) in the first data set. The X, Y data can be input either from the keyboard or from disk. In the latter case, you must input the disk file name (up to five characters, including the "wild card" indicated by an asterisk).

Once input, the data will be automatically scaled and plotted in light blue on a green background. Then, you will be asked for the number of points in the second data set, etc., and it will be plotted in dark blue with the same scaling as the first set. For effective overlaying, it is important to plot the data set with the larger Y values *first*. After the second data set is plotted, the titles of both plots will be printed above the graphs.

As an example, let's plot the data for a 30-year mortgage loan with an initial principal of $100,000 and an interest rate of 12.0%. The monthly payment for such a loan is $1,028.61, but how much of that is interest and how much goes to paying off the principal? The relevant data, year by year, are shown in Table 1.

Run the program and enter the following values:
X-axis, Y-axis, Plot 1, Plot 2: Year,$/1000, Total Paid, Principal
N Sets, XHI,XLO,XF: 2, 30, 0, 1
(XF = 1 because no scaling of XHI is needed)
YHI, YLO, YF: 400000, 0, 0.001
(YF scales YHI to be consistent with the Y-axis title, and to be four or fewer characters [400]
NPTS: 30
Keybrd or Disk: K
PT 1 1, 12343
PT 2 2, 24686
•
•
•
PT 30 30,370299
Then, for the second set of data
NPTS: 30
PT 1 1, 362
PT 2 2, 771
•
•
•
PT 30 30,100000

This results in a graph (Figure 1) which shows the total dollars paid (green/light blue interface), total interest paid (light blue area), and total principal paid (dark blue area). If, instead of plotting all 30 data points, you plot every other point (NPTS = 15), then each year's data is plotted as a discrete bar, rather than a continuum in the X-domain (Figure 2). The only depressing thing about this whole exercise is to see in black and white (or actually in red, green and blue) just how little principal gets paid off until the last few years of the loan! ■

Before typing this program, read "How to Enter Programs."

Multi-Color Graphs

```
10 DIM X(30), Y(30) : C% = 30
   : R1 = 18 : R2 = 146'ECAF
15 LB$ ="[SPACE30]"'BDKH
20 CL$ = "[SPACE39]"'BDSE
25 POKE 53280, 3 : POKE 53281, 3'CPRH
30 PRINT "[CLEAR]" "ENTER TITLES FOR
   X-AXIS, Y-AXIS, PLOT 1 AND PLOT
   2"'BAXN
35 INPUT XT$, YT$, T1$, T2$'BPCH
40 PRINT "[CLEAR]"'BATB
45 PRINT TAB(06) "[RVS]" "[RED]
   " LB$ "[SPACE2]"'CGJH
50 FOR L=1 TO 20 : PRINT TAB(06) "
   [RVS]" "[RED]" " " "[GREEN]" LB$ "
   [RED]" " " : NEXT'GMIH
55 PRINT TAB(6) "[RVS]" "[RED]" "
   [CMDR R,SHFT C4,CMDR R,SHFT C4,
   CMDR R,SHFT C4,CMDR R,SHFT C4,
   CMDR R,SHFT C4,CMDR R,SHFT C4,
   CMDR R] "'CCUG
60 PRINT TAB(6) "[UP]" "[RVS]" "
   [SHFT +]";'CDKF
65 FOR I=1 TO 4 : PRINT "[LEFT,UP,
   SHFT B,LEFT,UP,SHFT B,LEFT,UP,
   SHFT B,LEFT,UP,SHFT B,LEFT,UP,
   CMDR W]"; : NEXT : PRINT "[RVOFF]";
   'GIJW
70 PRINT "[HOME]" "NSETS,XHI,XLO,XF";
   'BBEI
75 INPUT NS,XHI,XLO,XF:SX=(XHI-XLO)/30
   :XB=INT(XHI*XF):XS=INT(XLO*XF)'KVJC
80 PRINT "[HOME]" CL$ "[HOME]" "YHI,
   YLO,YF";'BEOI
85 INPUT YHI,YLO,YF : SY=(YHI-YLO)/20
   : YB=INT(YHI*YF) : YS=INT(YLO*YF)
   'KSVC
90 PRINT "[DOWN]" TAB(5-LEN(STR$(YB)))
    YB : POKE 214,11 : PRINT'HSAN
95 PRINT YT$ : POKE 214,21 : PRINT
   : PRINT TAB(5-LEN(STR$(YS)))
   YS'IWBU
100 PRINT TAB(6-INT(LEN(STR$(XS))/2))
    XS TAB(35-INT((LEN(STR$(XB))-1)/2)
    )XB'OFWK
105 PRINT TAB(20) XT$;'CHJC
115 PRINT "[HOME]" CL$ "[HOME]
    " "ENTER NPTS";'BECF
```

```
120 INPUT NP'BCJX
125 PRINT "[HOME]" CL$ "[HOME]";
    : INPUT "DATA FROM KEYBOARD OR
    DISK";AN$'CJPM
130 PRINT "[HOME]" CL$ "[HOME]";
    : IF AN$ = "K" THEN 155'ELAD
135 INPUT "INSERT DISK;
     ENTER FILE NAME";FF$'BECM
140 OPEN 8,8,8,"0:"+FF$+",S,R"'DJJE
145 FOR I = 1 TO NP : INPUT#8,X(I),
    Y(I) : NEXT'FRVK
150 CLOSE 8 : GOTO 165'CFEC
155 FOR I=1 TO NP : PRINT "ENTER X,
    Y OF PT# ";I;'EIVN
160 INPUT X(I), Y(I) : PRINT "[HOME]
    " CL$ "[HOME]"; : NEXT'DPGG
165 FOR I=1 TO NP:X(I)=(X(I)-XLO)/SX
    :Y(I)=(Y(I)-YLO)/SY:NEXT
    :PRINT CHR$(C%);'MSGY
170 FOR I = 1 TO NP : POKE 214,21
    : PRINT : POKE 211,05'GTYJ
175 IX = INT(X(I))'CIYK
180 IY = INT(Y(I)): FY = Y(I)
    IY'ERYK
185 FOR J = 0 TO IX : PRINT "[RIGHT]";
     : NEXT'FHQM
190 IF IY = 0 THEN PRINT "[UP]";
    : GOTO 200'FIMJ
195 FOR J=1 TO IY : PRINT "[UP]
    " CHR$(R2) CHR$(32) "[LEFT]";
    : NEXT : PRINT "[UP]";'IRQT
200 IF FY < 0.06 THEN 245'DJBY
205 IF FY < 0.18 THEN PRINT CHR$(R1)
    CHR$(164) : GOTO 245'HTSJ
210 IF FY < 0.31 THEN PRINT CHR$(R1)
    CHR$(175) : GOTO 245'HTPF
215 IF FY < 0.43 THEN PRINT CHR$(R1)
    CHR$(185) : GOTO 245'HTTK
220 IF FY < 0.56 THEN PRINT CHR$(R1)
    CHR$(162) : GOTO 245'HTSG
225 IF FY < 0.68 THEN PRINT CHR$(R2)
    CHR$(184) : GOTO 245'HTBL
230 IF FY < 0.81 THEN PRINT CHR$(R2)
    CHR$(183) : GOTO 245'HTUH
235 IF FY < 0.93 THEN PRINT CHR$(R2)
    CHR$(163) : GOTO 245'HTVM
240 IF FY < 0.99 THEN PRINT CHR$(R2)
    CHR$(32) : GOTO 245'HSYI
245 PRINT CHR$(146) : NEXT'DGII
250 NS = NS - 1 : R1 = 146 : R2 = 18
    : C% = 31'FVGJ
255 IF NS > 0 THEN 115'DGYJ
260 PRINT "[HOME]" CL$ "[HOME]
    " TAB(10) "[GREEN]" "[RVS]
    " T1$ SPC(3) "[BLUE]" "[RVOFF]
    " T2$'DONH
265 GET N$ : IF N$ ="" THEN 265'EINL
270 END'BACD
```

END

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COMPUTER SCIENTIST

BY ISAAC MALITZ

An Experiment in Artificial Intelligence

Computers can be programmed to perform tasks which ordinarily would require human intelligence. For instance, computers have been programmed successfully to:

> Play checkers and backgammon at a championship level.
>
> Diagnose certain kinds of heart disease at a level of accuracy comparable to that of a physician.
>
> Advise geologists on the best locations to drill for oil.
>
> Assist psychotherapists in the diagnosis and treatment of certain kinds of emotional disorders.

Accomplishments like these have caused intense controversy concerning the "intelligence" of computers. Are computers capable of being truly intelligent in some sense? Are there any forms of human intelligence which cannot be mimicked by a computer? Are there certain kinds of intelligent tasks which computers can perform better than human beings?

One way to bring these issues into focus is look at some examples of artificial intelligence, to see what they really do and how they really work. That is what we shall do in this article. We will look at a computer program which plays a game called "Matcher" against a human being, and which does so in quite a competent manner. By observing how the program plays against a human, and by analyzing how the program works, we will gain insight into the nature of "computer intelligence."

The Game of Matcher

The game we shall discuss is known by many names (such as "matching pennies" or "throwing fingers"). We shall call it "Matcher." Two players, whom we shall call C and H, each secretly choose a number, either zero or one. They then show each other the number which they chose. If their choices match (i.e., if they both chose zero or both chose one), then C gets one point. If their choices don't match (i.e., C chose zero and H chose one, or vice versa), then H gets one point. The first player to get 100 points wins.

Are computers capable of being truly intelligent in some sense? Are there any forms of human intelligence which cannot be mimicked by a computer?

A player can win a game of Matcher 50% of the time, on the average, by simply making all of his choices randomly. However, to win more often than that, a player needs some kind of strategy. Usually a strategy will involve some method for guessing what the opposing player is likely to do next. It is important that the strategy not be too obvious; otherwise the opposing player is liable to see what the strategy is, and be able to guess what the first player is likely to do in each round of play.

A Computer Program to Play Matcher

The program in Listing 1 will play a fairly good game of Matcher against a human. The computer will play as player C, the human as player H. This means that in each play of the game, the goal of the computer is to guess the same number as the human, and the goal of the human is to guess the opposite number from the computer. Here is how the game goes:

> With each play of the game, the computer chooses either the number zero or one, and stores the choice in a variable.
>
> The computer then asks the human to input a zero or a one.
>
> The computer compares the numbers chosen by each player, and displays the outcome.

It would be possible, of course, to rig the program so that the computer wins on every play. But we promise you that the computer plays honestly!

Enter the program in Listing 1 into your Commodore 64. As you enter it, try to avoid reading the program, to figure out how it works. If you understand how the program works, this gives you an unfair advantage against the computer. Later in this article, we will analyze how the program works.

Now, let's play Matcher against the computer. To start the program, type RUN and press RETURN. The computer will secretly choose either a zero or one, and store it in a variable. Then the computer will display a "?" on the screen, which means that it wants you to choose either a zero or a one and enter it.

Enter a zero and press RETURN. The computer will compare its choice against yours, and it will report the outcome. If the computer's choice were a one, you would see the following screen display:

```
 ? 0
 1 0         H         0         1
```

The two numbers on the left are the numbers chosen by the computer and you, respectively. Next on the line, you will see the letter H or C. This signifies who won the round. The letter C signifies that the computer won the round; H signifies that the human won the round. In this example, the human won the round because the numbers chosen by the computer and by the human were different.

The next two numbers are the current score for the computer and for the human, respectively. So far, the computer has no points, and the human has one point. The game continues until one player gets 100 points.

The following example will illustrate a few moves from a sample game. (This particular sequence might not appear when you play against the computer—the computer tends to play differently each time.)

```
 ? 0
 1 0         H         0         1

 ? 0
 1 0         H         0         2

 ? 1
 1 1         C         1         2
```

```
? 0
0 0        C        2        2

? 1
1 1        C        3        2
```

This example shows five rounds of play. In the first round, the computer chooses a one, and the human chooses zero, so the human wins.

In the second round, the computer chooses one, and the human chooses zero, so the human wins again.

In the third round, both players choose a one, so the computer wins that round.

In the fourth round, both players choose a zero, so the computer wins that round.

In the fifth round, both players choose a one, so the computer wins that round.

So at the end of five rounds, the score is: computer 3, human 2.

Now, try playing the game against the computer. Try playing the game several times, in several different ways:

1. Play the game slowly and thoughtfully. Try to spot patterns in the way the computer plays, and try to guess what the computer will do next.
2. Play the game as fast as you can, without paying close attention to the computer's strategy or who is winning.
3. Try playing a really dumb game against the computer. For instance, see what happens if you play the number one every time. Or see what happens if you play the pattern 10101010... throughout the game.

You will discover that if you play slowly and thoughtfully, you will win part of the time, and the computer will probably win at least part of the time. Depending on your skill, one of the two players may win much more often than the other, or you may each win about half the time. (If you are really sharp, you may be able to figure out the computer's strategy. If you can do that, it is then possible to beat the computer almost every time.)

If you play the game quickly, without paying much attention to what you are doing, the computer will probably win considerably more than half the time. And if you play a really dumb game, the computer will beat you almost every time.

The conclusion most people draw from playing this game against the computer is that, in some sense, the computer does play with a certain amount of intelligence. The computer is smart enough to beat a human who plays a dumb game, or a careless game. If the human plays a thoughtful game, he or she will beat the computer a substantial part of the time; however, it takes a really smart human to beat the computer a large percentage of the time.

Before continuing with this article, we suggest that you try a series of games against the computer, using different kinds of playing strategies. What are your own conclusions about the "intelligence" of the computer?

How the Program Works

The program uses a two-part strategy against the human player. First, it looks for certain kinds of patterns in the way the human plays. The computer uses this information to help it guess what the human is likely to do next. Second, the program throws a certain amount of random behavior into its strategy. This makes it very difficult for the human to see patterns in the way the computer plays.

Here's how the strategy works. As the game proceeds, the program stores a history of all of the human's moves in a variable HH$. For example, if the first ten moves by the human were 1010110101, then at the end of the tenth round, HH$ would hold the value 1010110101.

To guess what the human will do next, the program takes a look at the last three moves made by the human. (In this example, the last three moves were 101.) The program then examines HH$, to determine what happened most often in the past, whenever that sequence of three moves occurred. (In this example, the sequence 101 occurred three times previously. Two of those times, the sequence was followed by a zero; the other time it was followed by a one.) If a zero followed more frequently than a one, then the program will guess zero as a next move. If a one followed more frequently, then the program will guess one. If neither occurred more frequently than the other, the program will make a random guess.

To keep this strategy from becoming too obvious, the program uses it only half the time. The other half of the time, the computer chooses zero or one randomly. This helps to camouflage the program's strategy.

The most important variables in the

Before typing this program, read "How to Enter Programs."

Listing 1. Matcher

```
200 IF RND(0)<.5 THEN 320'EIZA
210 T0=0:T1=0'CHHA
220 LA$=RIGHT$(HH$,3)'CKSB
230 FOR I=1 TO LEN(HH$)-3'FIVD
240 IF MID$(HH$,I,3)<>LA$THEN 270'FPFG
250 IF MID$(HH$,I+3,1)="0"THEN
    T0=T0+1'HPOJ
260 IF MID$(HH$,I+3,1)="1"THEN
    T1=T1+1'HPRK
270 NEXT I'BBCD
300 IF T0>T1 THEN PC$="0"
    :GOTO 400'FLUC
310 IF T0<T1 THEN PC$="1"
    :GOTO 400'FLXD
320 IF RND(0)<.5 THEN PC$="0"
    :GOTO 400'GMQF
330 PC$="1"'BDEB
400 INPUT PH$'BDOY
410 IF PH$<>"0"AND PH$<>"1"THEN
    400'HJYG
500 PRINT PC$;" ";PH$,'BJFB
510 IF PC$=PH$THEN TC=TC+1
    :PRINT"C",'GNJH
520 IF PC$<>PH$THEN TH=TH+1
    :PRINT"H",'HNWJ
530 PRINT TC,TH:PRINT'CGCE
540 IF(TC=100 OR TH=100)THEN END'GMHJ
550 HH$=HH$+PH$'CJCH
560 GOTO 200'BDBG
```

END

program are these:

> HH$ stores the history of all moves made by the human.
>
> PC$ is the number chosen by the computer in each round. PH$ is the number chosen by the human in each round. The values of PC$ and PH$ are allowed to be only zero or one.
>
> TC is the total number of points scored by the computer thus far in the game. TH is the total number of points scored by the human. When TC or TH reaches 100, the game is over.

Lines 200 to 330 determine the next value for PC$ (the choice made by the computer). The choice is made in either of two methods. Half the time, the choice is made randomly. The other half of the time, the choice is made by examining the history of the human's previous moves, and using that to help guess what the human is likely to do next.

Line 200 determines which of the two methods is used. If RND(0) is less than .5 (which will be true approximately half of the time), then the random method is used. The random method is carried out in lines 320 to 330. If RND(0) is equal to or greater than .5, then the computer uses the other method—examining the history of the human's previous moves, and using that to help guess what the human is likely to do next. That method is carried out in Lines 210 to 310.

In lines 220 to 310, the variable LA$ holds the last three moves stored in HH$. The variables T0 and T1 are used to count the number of times previous occurrences of LA$ were followed by zero and one, respectively. Lines 210 to 220 initialize the variables T0, T1 and LA$. Lines 230 to 270 do the actual counting.

Lines 230 to 270 are a FOR/NEXT loop, which scans through HH$ for all occurrences of the string LA$. Each time that string is found, either T0 is increased by one or T1 is increased by one, depending on whether a zero or one immediately follows the string.

Lines 300 and 310 set PC$ to zero or one depending on whether T0 or T1 is greater, and then branch to Line 400, which is the next section of the program. If T0=T1, then execution "falls through" to Line 320, which is the section of the program which makes random choices of value for PC$.

When humans play Matcher, certain kinds of patterns tend to slip into their behavior which they are not usually aware of. It is fairly easy to program a computer to look for some of these patterns.

Here's what these two lines accomplish: A new number between zero and one is obtained from the computer's random number generator. If that number is less than .5 (which will be the case about half the time), then PC$ is set to zero; otherwise, PC$ is set to one.

So, by the time we reach line 400, a value of zero or one has been set for PC$.

In lines 400-410, the human is asked to enter a value of zero or one, which is then stored in the variable PH$. This is the human's "move" for this round. The purpose of line 410 is to make sure that the human has entered either a zero or a one.

The next section of the program determines the results of this round, and displays the appropriate information on the screen. Lines 510-520 determine which player won this round. If PC$=PH$, then the computer won; if PC$<>PH$, then the human won.

Line 540 tells the computer to halt when either player has reached a score of 100. Line 550 updates the variable HH$ with the move just made by the human. HH$ holds the history of all moves by the human. The last line of the program "loops" the program back to line 200, to continue with the next round of play.

Comments/Questions

The computer plays a pretty good game of Matcher. There are two reasons why this is so: First, the computer does a fairly good job of detecting patterns in the human's play. When most humans play Matcher, they tend to favor certain sequences of zeros and ones. (For instance, I discovered that when I play, I tend to play the sequence 1010 almost twice as often as the sequence 1011.) Humans are not usually aware of what sequences they favor. However, it is easy for the computer to determine what sequences are favored. This gives the computer a potential advantage.

The second reason the computer does fairly well is that it is difficult for a human to figure out what strategy the computer is using, without observing the computer carefully for quite a long time. Once the computer's strategy is known, it is possible to defeat the computer almost every time.

Here's one way to do it: Enter the sequence 0000111101100101 over and over again. This sequence is "perfectly balanced"—i.e., every time this sequence is repeated, it generates each possible combination of four numbers exactly once. This perfect balance "trips up" the computer's strategy, and makes it guess wrong much of the time. But the strategy would be difficult to discover, without doing a statistical analysis of the computer's behavior.

We can sum up the strategic situation as follows: When humans play Matcher, certain kinds of patterns tend to slip into their behavior which they are not usually aware of. It is fairly easy to program a computer to look for some of these patterns. Also, it is possible to camouflage the computer's strategy with some random behavior; once camouflaged, it is difficult for a human being to detect. By means of pattern-recognition techniques and camouflaging techniques, the computer is able to play a competent game of Matcher.

It is possible for a human to mitigate the effectiveness of the computer's strategy, or defeat it badly. But to do so requires some real mental effort.

It is also possible to greatly increase the power of the program's intelligence. We could modify the program to look for much subtler patterns in the human's play, and to use much more sophisticated methods of guessing the human's next move. Also, we could introduce more sophisticated camouflaging techniques.

Although the program we have looked at is short and fairly simple, in many ways it is typical of many artificial intelligence programs for playing games. It plays quite competently—better than some human beings play. Its strategy exploits the strengths of computers (the ability to search through data and count rapidly, the ability to generate very complex "random" sequences). It also takes advantage of certain human weaknesses. (Human beings tend to favor certain sequences without realizing it; they sometimes have difficulty in recognizing patterns in situations which have been camouflaged with a certain amount of randomness.) Although the strategy works well a large part of the time, it also has flaws which can be exploited brutally by a clever human player.

All of this raises some interesting and difficult questions. Does our program exhibit "intelligent behavior?" The program plays Matcher better than some humans.

Does that mean that the program is "intelligent?" (Maybe it merely means that some humans fail to play Matcher intelligently.) Maybe we should speak of this program as being "intelligent," but having a "different kind of intelligence" from a human.

Our program uses a fairly rigid strategy when it plays Matcher. It would be possible to incorporate much more flexible strategies into the program. We could design the program to actually modify itself as it gains experience in playing Matcher. Would this have a bearing on whether we would consider the program intelligent?

Our program was designed by a human being. If the program is "intelligent" in some senses, should we attribute that intelligence to the program, or to the human being who designed the program?

Would it be possible to design a computer program which would play Matcher better than any human being possibly could? (Assume that the human opponent is not allowed to be assisted by a computer.)

Concluding Remarks

If you are interested in learning more about the field of artificial intelligence, one of the best ways to do this is to experiment with ways of improving the Matcher program in this article. Try to find ways to improve the program's average score against players of various skill levels. Try to devise the program's strategy so it is as difficult as possible for a human player to figure out what the strategy is. (Once the human knows what the computer's strategy is, the human will have an advantage over the computer.) Is it possible to devise a strategy which is undetectable by a human being?

If you develop a good Matcher program, we would like to see it. Mail a copy to Isaac Malitz, c/o this magazine. If an outstanding program is received, it will be published and discussed in a future column. ■

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Entries will be judged by a panel of nationally known computer artists. Each entry must be wholly the product of the developer in whose name the entry has been submitted. Outside assistance is expressly prohibited and will provide cause for disqualification. An entry must consist of no more than two self-contained, complete programs on disk. A photo of the screen display or a program print-out does not constitute an acceptable entry. Entries become the property of Contemporary Marketing, Inc., which reserves the right to adapt, use or publish all entries received. No disks will be returned, so be sure to make a copy of your entry before you submit it to the contest.

Contemporary Marketing, Inc. assumes no responsibility for lost, late or misdirected entries. Non-winning entries will not be acknowledged. Winners will be notified by February 28, 1986. Taxes on cash prizes are the winners responsibilities.

Offer void wherever prohibited or restricted by law.

Fame and Fortune Can be Yours!

Grand Prize: $500 and Publication in *Commodore Power/Play*
Five Runners Up: $100 and Publication in *Commodore Power/Play*

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PICTURE TITLE #1 ______________________________

PICTURE TITLE #2 ______________________________

USER GROUPS

Commodore user groups nationwide and around the world provide invaluable assistance to Commodore computerists. If you are looking for people who share your computing interests, or if you need help getting started with your computer, contact the group near you.

This list is compiled from groups who responded to a survey conducted by Pete Baczor, Commodore's user group coordinator. If you would like your group to appear here, or if you need information about Commodore's user group support, contact Pete at Commodore Business Machines, 1200 Wilson Drive, West Chester, PA 19380.

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User Group Support Program

Commodore is creating a program to support Commodore User Groups.

The two major components—approved user group status and a newsletter are now available.

Approved user group status is given to any user group meeting our basic criteria. These user groups receive meeting posters and membership cards and are automatically sent Input/Output each month. In addition they can request a speaker from Commodore to come and discuss (and demonstrate) new products at one of their meetings.

The newsletter, INPUT/OUTPUT, will include announcements, user group programs, calendar of events, letters, questions, product specifications, programs, and surveys. It will be a newsletter FOR user groups BY user groups supported by Commodore without advertisements.

For future issues of the newsletter Commodore is accepting announcements of user group activities, articles of interest, letters to the editor, and general questions. Please forward all correspondence with the name of your user group to:

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BROADSIDES

Continued from page 30

computer shows the ensuing boarding action in a special, semi-animated boarding sequence. The screen shifts to a close-up view of the two side-by-side ships. In addition to snipers in the rigging, players control the actions of swordfighters who can be directed to adopt a variety of offensive and defensive stances. Ships may be captured through boarding or, if one player manages to cut all grapples, they drift apart and you return to the sailing screen. Overall, boarding actions usually turn into prolonged, costly affairs, and the sequence itself becomes tedious, particularly in comparison to the almost breathless action of the sailing part of the game.

Victory is a matter of sinking or successfully boarding an enemy ship, or forcing the ship to strike her colors (surrender). The surrender happens when the damage suffered by one ship far outweighs the damage inflicted on her opponent. All victories, however, are not created equal: After each game, the computer evaluates the damage wrought by both ships and awards a number of victory points. This is especially useful when players wish to compare victories over a series of games.

As testimony to *Broadsides'* accuracy as a simulation, the tactics that proved most effective for captains of the era will also work best in the game. The strengths and weaknesses of a ship, together with those of the enemy, will generally determine basic battle tactics. Slow sailers loaded down with carronades and large crews should seek a close-in duel, preferably within three hundred yards. On the other hand, a fast sailing and turning ship, when matched against a more ponderous opponent, should make the most of her maneuverability and not get lured into a toe-to-toe slugfest at close range.

Maintaining the initiative in combat is also of primary importance. This can be accomplished by maneuvering a ship between the wind and her opponent, historically known as gaining the weather gauge. The ship can then attack swiftly downwind at the moment of her captain's choosing. The enemy ship, in contrast, can attempt to shorten the range only by turning into the wind, thereby reducing her sailing speed considerably.

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BROADSIDES

Sometimes, the realism of *Broadsides* is startling. For instance, in battle, players tend to observe the enemy ship silhouette to see the effects of their broadsides, much as a captain standing on the quarterdeck of his ship must have done some 200 years ago. The continuous ticking of the game clock without any breaks in the action also conveys an approximate sense of the difficulties of making snap decisions under pressure (and cannon fire).

In terms of historical accuracy, though, *Broadsides* possesses a few faults. The statistics for some of the ships seem questionable, particularly with regard to armament. British frigates like the *Guerriere* and *Macedonian*, for example, are armed with nowhere near their correct allotment of carronades. Of course, facts often vary depending on the reference book consulted, but a few important discrepancies—such as the one cited above—do appear between the ship statistics listed in the rule book and generally accepted historical data.

Broadsides can also be faulted for beginning every game with the opposing ships set parallel to one another with the wind at their backs. Not only is this unrealistic and artificial, but it also brings many contests to an end before they hardly get underway. Since ships start under the guns of the enemy, one side often gains an early advantage, and any attempts at imaginative maneuvering run the risk of instant disaster.

However, never fear: The rule book provides complete instructions on how to alter any of the ship statistics in the 11 scenarios. The manual also presents statistics for all major kinds of British, French, American, and Spanish ships of the Napoleonic period, enabling players to devise an endless number of scenarios of their own.

Broadsides represents the melding of two disparate types of games—the detailed historical simulation and the fast-action arcade game—into one seamless and immensely entertaining product. Victory requires a blend of skill, resourcefulness, nerve, and elan—and successful players can congratulate themselves on exhibiting the very qualities that distinguished the most illustrious, real-life captains of the era. C

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Continued from page 75

program format somewhat like BASIC. The "trace" feature shows SID values as the music plays and is a good way to learn how SID works. Several disks of music written by owners of *Synthy* are available separately from Abacus.

Music Education

Although these programs are educational, they are not just for children. They frequently approach music theory and composition very differently from what you may be used to.

Music Maestro from Springboard is a collection of four musical games for kids four to ten. It teaches note names and their locations on a graphic on-screen piano keyboard. Kids can record their own melodies to use in the games, and musical experimentation is encouraged.

The *Notable Phantom* from DesignWare includes a thin but tough plastic keyboard overlay for the 64 with 20 full-sized piano keys. The game, for kids from five to ten, features ghosts, bats, spiders and phantoms that do things like carry note names onto the screen, which are then to be played on the keyboard. There's some ear training exercises and children can compose and save their own melodies.

Songwriter from Scarborough (ages five to adult) is gentle and deceivingly simple in its approach to complex musical ideas. It's monophonic and doesn't use standard music notation, but manages to introduce sophisticated musical concepts with a player-piano roll on-screen. It will not insult an adult's intelligence and comes with nice music on the disk and thought-provoking documentation. You can record your own monophonic melody lines.

Bravo! from Human Engineered Software is for children nine and up and requires a joystick. It's an introduction to music notation on the treble clef and is divided into six sections which build to a mini-composer where children place notes on the treble staff and record single-voice melodies.

Rock'N'Rhythm from Spinnaker for ages ten to adult puts a recording studio on the screen, complete with tape deck and joystick-playable drum set. Children can record melody and drum tracks and play them on the jukebox. Nine songs are supplied.

The *Colortone Keyboard* from Waveform is a touch-sensitive, membrane lap pad that plugs into the 64. The shaded illustration on it makes the 25 piano keys look moveable, but they're not. Thirteen two-voice, pre-recorded songs come with it and you play SID's third voice from the keyboard and Touch Harp, with a choice of eight pre-set instrument sounds and eleven scales. The touch of a function key will lock out those tones which are outside the key of the song you're playing, so you can't play sour notes. Brightly colored icons on the screen represent the function keys and music notation scrolls across as the music sounds. It's simple, fun and compatible with *MusiCalc*.

CocoNotes from CBS Software requires a joystick. It's a musical game for ages seven to twelve that lets children pick an accompaniment to fish for notes (with the joystick) in a race against the clock.

Movie Musical Madness by CBS Software (for ages eight to adult) lets children combine simple screen graphics, characters and music to make a short "movie" which can be saved to disk. Another program from CBS called *Halftime Battlin' Bands* lets children pit their own marching tunes and formations against those of a rival.

Foolin' Around

In addition to the computer music albums from Passport Designs and Sight & Sound, several other programs available for the 64 have preprogrammed music in them. You simply move the joystick in *Dancing Feats* from SoftSync to play a melody with a wide selection of accompaniments (this, and the Colortone Keyboard are my pre-schooler favorites). *Moondust* from Creative Software and *Web Dimension* from Activision are gentle games which offer more than just listening; various skill levels reward you with music. All of these programs have fascinating screen displays. ■

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HOW TO ENTER PROGRAMS in *Power/Play*

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN,RIGHT2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The following chart tells you the keys to press for any word or words inside of brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to the keystrokes shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270", type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

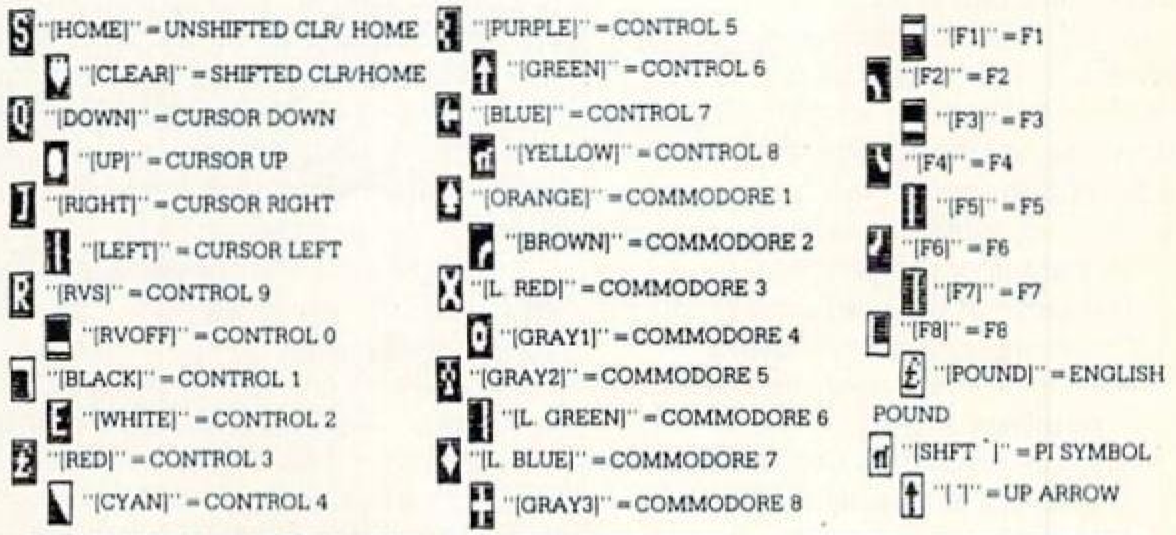
OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88) characters on one line. You can enter these lines by abbreviating the commands when

CHART OF SPECIAL CHARACTER COMMANDS



"[HOME]" = UNSHIFTED CLR/ HOME
"[CLEAR]" = SHIFTED CLR/HOME
"[DOWN]" = CURSOR DOWN
"[UP]" = CURSOR UP
"[RIGHT]" = CURSOR RIGHT
"[LEFT]" = CURSOR LEFT
"[RVS]" = CONTROL 9
"[RVOFF]" = CONTROL 0
"[BLACK]" = CONTROL 1
"[WHITE]" = CONTROL 2
"[RED]" = CONTROL 3
"[CYAN]" = CONTROL 4
"[PURPLE]" = CONTROL 5
"[GREEN]" = CONTROL 6
"[BLUE]" = CONTROL 7
"[YELLOW]" = CONTROL 8
"[ORANGE]" = COMMODORE 1
"[BROWN]" = COMMODORE 2
"[L. RED]" = COMMODORE 3
"[GRAY1]" = COMMODORE 4
"[GRAY2]" = COMMODORE 5
"[L. GREEN]" = COMMODORE 6
"[L. BLUE]" = COMMODORE 7
"[GRAY3]" = COMMODORE 8
"[F1]" = F1
"[F2]" = F2
"[F3]" = F3
"[F4]" = F4
"[F5]" = F5
"[F6]" = F6
"[F7]" = F7
"[F8]" = F8
"[POUND]" = ENGLISH POUND
"[SHFT ^]" = PI SYMBOL
"[^]" = UP ARROW

GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,COMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Power/Play Magazine
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem

How to Use the Magazine Entry Program

The Magazine Entry Program on page 125 is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 50052, and just lets you know that the program is running. If everything is ok, the program will finish running and tell you to type NEW. If there is a problem with the data statements, the program will tell you where to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

# OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word misspelled. Check the line in the magazine again and correct the mistake.

Magazine Entry Program

The Magazine Entry Program is available on disk, along with the other programs in this magazine, for $9.95. To order contact Loadstar at 1-800-831-2694.

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,8D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D;C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,BD,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

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Open up the world of telecommunications with this powerful 300-1200 baud smart modem specifically designed for your Commodore computer. This is a complete modem-cable-software package. Suggested retail on the package is $339.95 — Unisource low priced at $219.95! The unit is capable of full unattended operation in conjunction with stand alone terminals and computers which have an RS 232 interface. Volksmodem XII features full Bell compatibility, serial command operation, full and half duplex, auto answer, auto dial, tone and pulse dialing, busy detection and more — all of the features found on modems costing hundreds more! **ANC 107C** **$219.95**

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Continued from pg. 84

vided on the disk that illustrate programming techniques and reinforce material covered in the text. A rudimentary word processing program is also included that further exemplifies what can be done with BASIC. While it's not a commercial-grade word processor, it does indeed work, and contains a surprising number of useful features.

The course is divided into modules that cover specific facets of programming, including variables, arrays, graphics, sound, sprites, screen control and a host of other topics. It was designed specifically to aid and instruct the new user, regardless of age.

The Whiz Kids Educational Computer Centres is an educational computer facility based in Canada. Their stated goal is to provide a tutorial that establishes "a solid foundation which allows the user to go on to enjoy the experience of creative computing." They've achieved their goal with this package. It's definitely one of the better tutorial products available.

Other Sources

In addition to these tutorials, there are literally dozens of excellent books that deal with BASIC programming and other aspects of Commodore 64 computing as well. A visit to the library, bookstore or your local computer dealer will give you a better idea of what's available. Of course, be sure to check the mail-order ads of computer magazines, since this is also a great way of procuring information on other tutorial products.

If you're new to computing, I suggest finding a user group in your area and joining it. User groups are a great way to learn more about computing, make friends with people who have similar interests, and have fun at the same time.

You'll find that the more you learn about your computer, the more you'll enjoy using it. Don't be shy about asking questions of other users—they too had to start somewhere, and they'll be more than willing to help you.

Oh, yes—you'll also find lots of helpful information right here in *Commodore Power/Play*, as well as our sister publication *Commodore Microcomputers*, so don't miss an issue of either magazine. Happy hacking! C

http://www.oldgamesitalia.net/ http://www.oldgamesitalia.net/

POWER PLAY'S NEWS FROM THE BACK

Computer Covers

Synchronicity Software has released professional computer covers for the Commodore 64 keyboard, 1701/1702 video monitor, 1541 disk drive, and most leading printers. Each cover is made of water-resistant vinyl and comes in a variety of colors: blue, gold, black, brown and red. The cost of the covers runs from $7.95 to $9.95. (Synchronicity Software, P.O. Box 1578, Spring Valley, CA 92077-0220)

MASTERTRONIC
The Quest for the Holy Grail
MASTERTRONIC

Monty Python

Those comedy stars of movies and television are finally in the chips with **Monty Python's Quest for the Holy Grail**, a new adventure program for the Commodore 64 from Mastertronic International. The legendary comedy team's distinctive brand of humor, which has made them stars on both sides of the Atlantic, adds a new dimension to computer adventuring.

The gamer enters brief commands on the keyboard to guide Sir Tappin on his not-altogether-serious search for the Holy Grail. The computer quickly prints out a response and sketches a line drawing of what the hero sees. Encounters include HIC, LIC and NIC, all of whom are bent on completing their own missions, and their brother SIC, a terrible foe to be avoided at all costs. Creatures such as the dreaded White Rabbit ravage the landscape, so Sir Tappin can easily find himself in explosive situations.

The program retails for $9.99. (Mastertronic International, 407 Park Avenue South, Suite 16A, New York, NY 10016)

Electronic Cookbook

The **Electronic Cookbook** from Arcturus Software is a recipe storage and retrieval system for the Commodore 64. It allows you to display recipes on-screen or print them out to almost all printers. The recipes can be easily edited and the function keys select the menu options, making the program simple to use even for those with little keyboard experience. An added bonus is the inclusion of 31 free recipes.

A wide variety of main courses, beverages, and desserts are included. The program also talks. You are notified by speech and by a screen message whenever you reach a major section in the program.

The program retails for $20.00 (U.S.) and $25.00 (Canada) plus $2.50 for postage and handling. (Arcturus Software, 2332 Palisade Drive SW, Calgary, Alberta T2V 3V1 Canada)

Medical Data Base

DMC Software has released **Emed**, a medical data base for the Commodore 64. **Emed** is fully men-driven and has extensive on-line help. **Emed** contains data on over 460 diseases and 325 symptoms. The user can search and review all diseases for one symptom or all symptoms for one disease. **Emed** also features a diagnostics program where the user can select applicable symptoms and the most probable diseases are displayed. It is available for $29.95. (DMS Software, Rt. 1 Box 364, Clinton, LA 70722)

Portable Practice Keyboard

Anyone who is buying or learning about computers quickly discovers that all computer keyboards are not alike. Even if you are experienced at typing, you must learn the positions of special function keys. In order to make keyboard "fingering" easier to learn, the Computer Practice Keyboard Company has introduced a printed keyboard for the Commodore 64, PET 4032, and VIC 20 with each special key function explained so you can learn and practice finger positions any time or any place. Each keyboard is printed on sturdy 8-1/2 x 11-inch stock to fit standard-size binders. A plastic lamination is applied to protect and keep the keyboard clean, and a brief dictionary of computer words is printed on the back of each keyboard. The retail price for each Portable Keyboard is $3.95 plus $1.00 for postage, or two for $7.50 plus $1.00 for postage. They come with a money-back warranty. (Computer Practice Keyboard Company, 616 9th Street, Union City, NJ 07087)

NEXT MONTH

WATCH FOR THESE UPCOMING ISSUES

Commodore Microcomputers, November/December: In this last issue of 1985 you'll find:

- THE BEST OF 1985. A buyer's guide to the best products we reviewed this year in both our magazines. A handy reference when you need to make buying decisions.
- Commodore Launches the Amiga. How does Commodore's newest, hottest computer stack up against the Mac and the IBM PC-AT? Find out in detail as freelance computer expert Louis Wallace covers the Amiga's spectacular launch ceremony.
- Buyer's Guide to Word Processors for the 64. Probably the most comprehensive look at C64 word processors ever assembled. You can't afford not to read it.

Commodore Customer Support Hotline

HAS A NEW NUMBER

215-436-4200

BE SURE TO MAKE A NOTE OF IT!

Answers for pg.92

			F		R								
	C	L	O	S	E		I						
			R		S		N	E	X	T			
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G	E	T			O		U		P	E	E	K	
O		O			R	E	T	U	R	N			
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U							R	U	N		E		A
B	A	S	I	C			E		T	A	N		B
	N		N		L	O	A	D		B			
	D	A	T	A			D			S	A	V	E

ADVERTISERS INDEX

Advertiser Index	Reader Service No.	Page No.
Access Software	32	**27**
Cardco	1	**CIII**
C.M.S.	2	**2**
C.O.M.B. Company	*	**119, 121**
Commodore Corporate	*	**CII-1/86-87**
Commodore Software	*	**25, 65**
Computer Book Club	3	**61**
Comtel Group	33	**32**
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GSR Software Company	6	**98**
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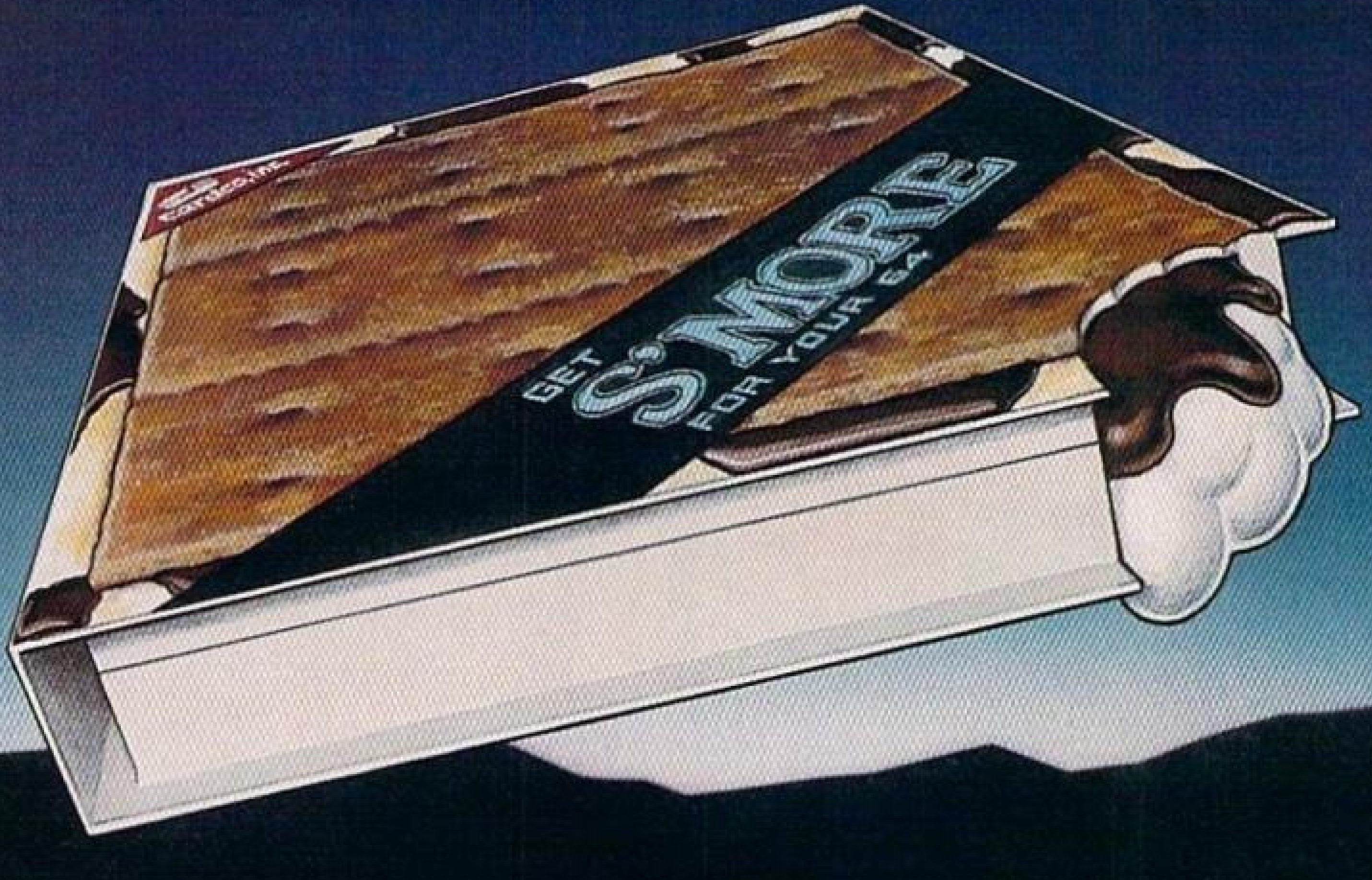

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